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FIG. 1.—Compression of abdominal aorta.

FIG. 2.—Compression of abdominal aorta; finger upon common femoral to ascertain arrest of blood current.

ANNALS OF SURGERY.

A MODE OF CONTROLLING THE CIRCULATION THROUGH THE ABDOMINAL AORTA.

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THE following mode of controlling the circulation through the abdominal aorta has been sufficiently tested by the author to warrant its publication.

As the patient lies on his back on the table, the assistant, facing patient's feet, stands on the left side of the table in a line with patient's umbilicus. He then places his closed right hand upon the patient's abdomen a little to the left of the middle line, the knuckles of the index finger just touching the upper border of the umbilicus, so that the whole shut hand will embrace about three inches of the distal extremity of the aorta above its bifurcation. The assistant then standing upon his left foot, his right foot crossing his left and resting upon the toes of the right —an attitude commonly assumed by public speakers—leans upon his right hand and thereby exercises the necessary amount of pressure. With the index finger of the assistant's left hand, the weight necessary for the purpose can easily be estimated by the effect produced upon the flow of blood through the common femoral at the brim of the pelvis. Whenever the flow of blood through the femorals is absolutely arrested the abdominal aorta is sufficiently controlled, and no further weight ought to be applied.

The weight exercised can be varied at will by increasing or decreasing the angle which the assistant's body makes with the floor. The position which the assistant assumes relatively to the patient is represented in the accompanying photographs.

As the abdominal aorta sometimes bifurcates higher than usual, before the operation is commenced a trial of the effect of the pressure at the part selected ought to be made, testing the result of pressure on *both* femorals. When both are equally controlled the bifurcation occurs below the point pressed on; when only one is controlled the hand requires to be placed on a more proximal part.

As there is no direct muscular effort required in maintaining the pressure further than the preservation of the equilibrium, the position can be maintained by the assistant without undue strain on his part, and without shifting his hand for at least half an hour, a time amply sufficient for the performance of most operations requiring the control of the circulation through the abdominal aorta.

In order to eliminate the personal equation, the author has usually selected a different person each time he has had occasion to control the abdominal aorta, and while there were slight differences between the various persons chosen, the object was always efficiently secured. The majority of those who exercised pressure in this way said, at the end of the operation, that they could have further maintained the pressure for a considerable time.

Among the cases in the author's practice in which the abdominal aorta was thus controlled were disarticulations at the hip joint, amputations at the upper third of the femur, large pelvic vascular tumors, intra-pelvic hæmorrhage, and traumatic hæmorrhage from the external iliacs; in all the control of the circulation was absolute. In the amputations of the hip none of the patients lost from the proximal side of the cut vessels more than a couple of ounces of blood, and that only from the oozing of the general surface; there was none from the main vessels. In amputations also, after the main vessels were ligatured, the assistant could, by a slight momentary relaxation of the pressure,

"show" the position of any hidden or retracted vessel without altering the position of the hand relatively to the aorta. This form of pressure would be equally valuable for uterine hæmorrhage.

A priori one might fear that pressure might be exerted on some of the coils of the small intestine and thereby produce injury. As far as one can judge this did not result. Only on two occasions did the patient complain, for a few hours after the operation, of a sensation of pain over the part pressed on, which was only elicited on interrogation. All the others, though specifically asked, said they had no pain.

There is one point to be guarded against. Should the patient vomit or cough violently the pressure would require to be increased, as otherwise the muscles in the abdominal walls are apt, during the strain, to elevate the hand from the aorta. The operation during vomiting might be postponed for a few minutes while local pressure is applied.

The author has applied this method in his practice for over fifteen years, and has found it simple, always ready, easily applied and efficient.

OBSERVATIONS UPON APPENDICITIS.

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THE relation of the vermiform appendix to certain inflammatory and suppurative conditions in the neighborhood of the cæcum has been the source of careful and extended study on the part of surgeons during the last few years, this being comparable, to a certain extent, to the interest manifested at the beginning of the present decade in the inflammatory and suppurative lesions of the Fallopian tubes, when careful study of these brought out the truths which relegated to the musty pathology of the past such indefinite terms as "parametritis" and "perimetritis," as well as "pelvic abscess," and substituted therefore salpingitis and pyosalpinx. The interest awakened in appendical lesions has led to a steadily increasing demand for definite knowledge of this, so far as known, useless organ and its diseases.

Exceptionally favorable opportunities have been afforded me of observing the disease appendicitis, in its different forms, both in hospital and private practice. With the hope of shedding some light upon what has been, until quite recently one of the darkest chapters in surgical pathology, as well as to offer such observations upon the management of the affection as have been suggested to me as the result of my own somewhat extensive experience in connection with it, the present work has been undertaken.

The subject matter will be presented in the following order:

I. Anatomical Considerations. II. The Inflammatory Lesions of the Appendix. III. The Ætiology of Appendicitis. IV. The Clinical History of Acute Appendicitis. V. Special Types of Appendicitis. VI. Complications and Sequelæ of

Appendicitis. VII. The Morbid Anatomy of Appendicitis. VIII. The Diagnosis of Appendicitis. IX. The Prognosis of Appendicitis. X. The Treatment of Appendicitis. XI. An Analytical Study of 143 Cases of Appendicitis Coming Under the Author's Observation.

I. Anatomical Considerations.

The *caput cæcum coli* is the large blind pouch which represents the initial portion of the colon. It is usually defined as that portion of the latter which lies below the level of the ileo-cæcal valve. Its cavity measures somewhat more in the transverse than in the vertical diameter, being about two and a half inches in length by three inches in breadth. Its usual location is in the right iliac region lying upon the psoas magnus muscle, and its most dependent point or apex projects just beyond the inner edge of that muscle. This corresponds, externally, to a point slightly to the inner side of the middle of Poupart's ligament.

Occasionally the cæcum will be found external to the psoas, and lying upon the iliacus muscle in the right iliac fossa; or the bulk of the caput may lie upon the latter muscle, while the apex rests upon the psoas. Again, the cæcum may hang over the pelvic brim entirely clear of these structures, or be lodged within the cavity of the true pelvis. After the second month of intra-uterine life, the cæcum gradually recedes from the neighborhood of the umbilicus, which is the original position, and finally becomes fixed in the right iliac fossa. Instances of non-descent of the cæcum are not as infrequent as is generally supposed.

The condition of the cæcum will determine, to some extent, its relation to the surrounding parts. Thus, when distended, it may occupy the entire right iliac fossa, crowding the small intestine toward the median line. In the empty state, on the other hand, it is covered over by loops of the small intestine, or these may even reach to its outer side.

The direction of the cæcum is not in a straight line with the otherwise vertically placed ascending colon, but is somewhat obliquely placed from above downward and to the left.

The cæcum is maintained in its position in the right iliac fossa by the posterior reflection of the peritoneum, leaving a

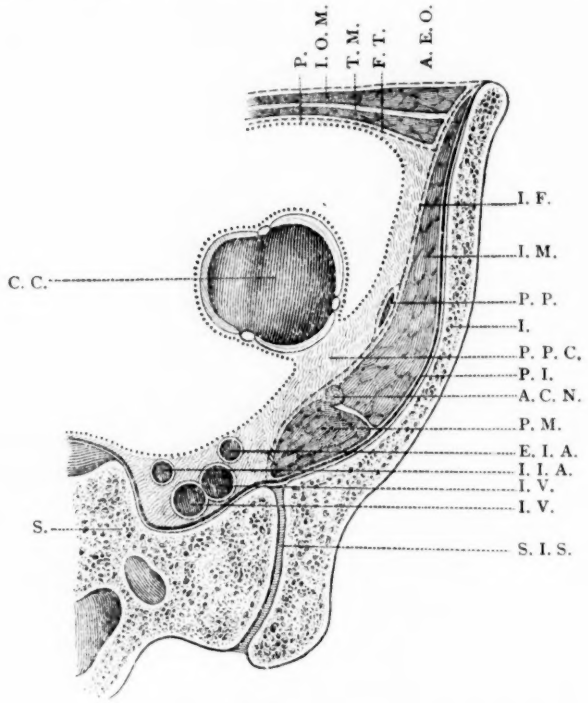

FIG. 1.—A transverse horizontal section through the pelvis at the level of the anterior superior spinous process of the ilium and sacro-vertebral angle.

Right Side.—Lower segment of the section. Adult male (after Tillaux).

A. E. O.—Aponeurosis of the external oblique muscle (broken line).
C. C.—Caput Coli.
I. F.—Iliac fascia broken line).
T. F.—Transversalis fascia (broken line).
E. I. A.—External iliac artery.
I. I. A.—Internal iliac artery.
I. M.—Iliacus muscle.
P. M.—Psoas magnus.
P. P.—Psoas parvus.
A. C. N.—Anterior crural nerve.
I.—Ilium.
P. I.—Periosteum of the ilium.
P.—Peritoneum (dotted line).
I. O. M.—Internal oblique muscle.
S.—Sacrum.
S. I. S.—Sacro-iliac symphysis.
T. M.—Transversalis muscle.
P. P. C.—Post-peritoneal connective tissue.
I. V.—Iliac veins.

variable portion of the posterior surface of this portion of the large intestine applied against the iliac fascia, with more or less

connective tissue the retro-cæcal co nnective tissue) between (Fig. 1). When a true mesocæcum exists this serves to connect the portion of the large intestine t› the right iliac fossa.

The topographical anatomy of the cæcum, particularly with reference to its relations to the retro-cæcal and post-peritoneal connective tissue, as well as the large vessels in the neighborhood, is of importance in connection with the inflammatory lesions of and operations upon the vermiform appendix. If a transverse and horizontal section be made through the iliac fossa

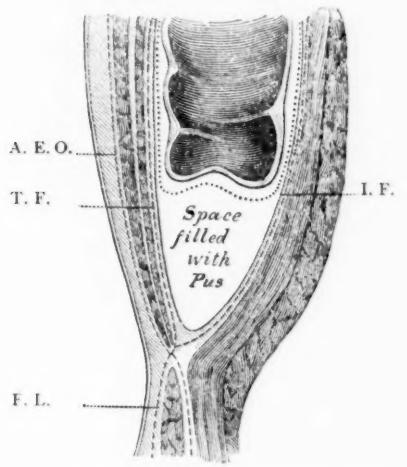

FIG. 2.—A. E. O.—Aponeurosis of the external oblique (broken line).
I. F.—Iliac fascia (broken line).
F. L.—Fascia lata (broken line).
Purulent collection shown crowding the peritoneum (dotted line) in an upward direction and limited below by the junction of the iliac fascia and the transversalis fascia at the crural arch.
T. F.—Transversalis fascia (after Tillaux).

upon a level with the anterior superior spinous process of the ilium and the sacro-vertebral angle, the average relative position of these parts in the adult will appear as shown in Figure 1.

The relation of the retro-cæcal and post-peritoneal connective tissue is of especial importance in those cases of appendical abscess in which the appendix is only partially covered by peritoneum. Under these circumstances infection of the struc-

tures above named gives rise to a true iliac phlegmon (Grisolle). The suppurative process develops beneath the peritoneum and crowds that structure in an upward direction, as well as anteriorly. There is thus formed in the iliac fossa a collection of purulent material situated sub-peritoneally, the boundaries of which are as follows: In front the transversalis fascia prevents its further progress in that direction, while the iliac fascia limits it posteriorly. The curved arch forms its boundary inferiorly.

If the pus is not evacuated early it may find its way into the general cavity of the peritoneum by a process of ulceration after crowding this structure in an upward direction, as shown by the dotted line (Fig. 2).

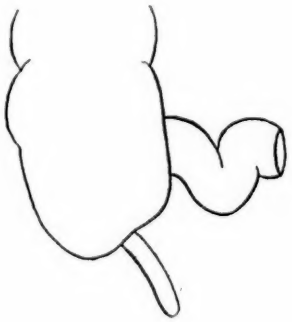

FIG. 3.

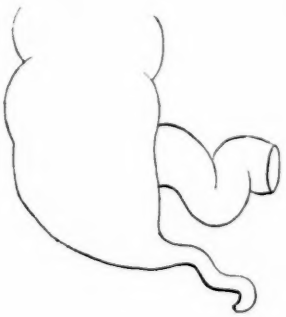

FIG. 4.

The passage of the external iliac artery and vein through the post-peritoneal connective tissue and forming the inner limit of the iliac fossa, offers an opportunity for the purulent collection to follow the sheath of these vessels and to make its appearance upon the anterior and inner aspect of the thigh. This occurs somewhat rarely in appendicitis, although one such case has come under my observation.

The appendix vermiformis cæci is an atrophied organ, the rudimentary remnant of the lengthened cæcum found in all mammalia except man, and some of the higher quadrumana. It is also found in the wombat. It is usually attached to what was originally the apex of the cæcum, close to the ileo-cæcal valve on the inner and posterior side of the bowel (Fig. 3). Excep-

tionally the fœtal type persists in which case the appendix may become a continuation of the long axis of the colon (Fig. 4). In another form the appendix appears between two bulging sacculi Fig. 5 ; or, in still another, the root of the appendix is posterior to the inferior angle of junction of the ileum with the cæcum (Treves), (Fig. 6).

Instances of non-descent of the cæcum result in a corresponding abnormal situation of the appendix ; the latter has even been found lying to the left of the median line. Lennander mentions having observed in a dissection of a sixteen-year-old boy, the cæcum, together with an appendix nine inches long, lying against the spleen in the left hypochondriac region.[1]

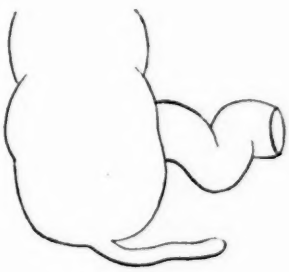

FIG. 5.

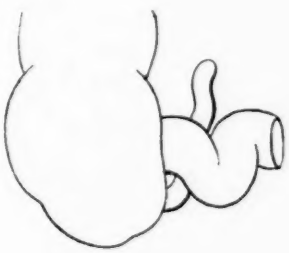

FIG. 6.

The length of the appendix varies from one to nine and a half inches ; the average length is three and one-half inches. Its diameter is that of a goose quill. When a meso-appendix is present, this comes off from the left layer of the mesentery of the ileum, with which, together with the points of its attachment to the appendix, it forms two sides of a triangle ; the third side of the triangle is formed by the free border of meso-appendix. In 200 cadavers examined by Ferguson, of Toronto,[2] the appendix in 100 cases was found to have a mesentery of its own. In the adult the mesentery extends from one-third to two-thirds of the appendix, and a fringe-like prolongation reaches from this point to the tip of the organ. This is composed of two peritoneal

[1] Sammlung klinischer Vorträge, No. 75, August, 1893.

[2] American Journal of the Medical Sciences, January, 1891.

layers, forming a fold between which considerable fat is sometimes deposited. This fold may sometimes enclose the iliac vessels as well. In the female the meso-appendix has a prolongation which is lost in the broad ligament; this is described by Clado as the appendiculo-ovarian ligament.[1]

The shape of the appendix varies greatly. It may be perfectly straight, particularly where the mesentery is very short or absent. The fact that the mesentery is frequently too short for the organ often gives the latter a curved shape. Shortening of more than one portion of the mesentery may give to the appendix a lateral curve, a succession of curves, or a cork-screw (periwinkle) shape.

The structure of the appendix is similar to that of the large intestine, but is not identical with it. From without inward are to be found the following layers:

(1) The peritoneal investment of the organ. The completeness with which this covers the organ varies greatly. Sometimes it is entirely covered, as a finger is covered by a glove; in other instances it is but partially covered. The latter condition was found in more than one-quarter of the observations upon the subject which have been recorded, including those of Maurin, who, in the examination of 112 subjects, found the appendix in the entire number completely surrounded by peritoneum. In the remaining three-fourths the appendix is free in the peritoneal cavity. In those instances in which it is only partially covered by peritoneum, the uncovered portion is in direct contact with the post-peritoneal connective tissue.

(2) The muscular layer. This consists of a few long non-striated muscular fibres, with which are mingled a varying amount of fibrous tissue, constituting the outer portion of the muscular layer. The inner part of the muscular coat forms the greater portion of the walls of the appendix. It consists mainly of fine fibrous tissue, arranged in a more or less circular manner. According to Austin Flint, circular muscular fibres do not exist.[2]

[1] Société de Biologie, January 30, 1892; Revue de Chirurgie, March, 1892.

[2] Text-book on Human Physiology, New York, 1888, p. 258.

(3) A relatively thick layer of connective tissue, with arterial openings and lymphatic depressions—the sub-mucosa.

(4) A mucous coat, having a thin muscularis mucosa, and lined with cylindrical epithelium. The mucosa contains tubular glands and closed follicles. According to Clado, glandular structure is also found in the walls of the appendix in small areas of adipose tissue. A duplicature of the cæcal mucous membrane near the orifice of the appendix, is sometimes described as a valve (Gerlach). This is not constant, and, even when present, forms but an incomplete valve.

The histological differences vary almost as much as the more readily recognized anatomical forms. The appendix is especially rich in lymphoid tissue, greatly resembling the tonsils in this respect. The proportion of lymphoid tissue may also vary greatly in different individuals, and at different parts of the same appendix. In some instances it is almost entirely absent. It is, as a rule, most abundant in children, although it is not by any means absent in the aged. Frequently the lymphoid tissue projects beyond the level of the mucous membrane, and encroaches upon the lumen of the organ. The mucous membrane itself is often built up of closely applied lymphoid cells, which are evidently undergoing the process of proliferation.[1]

The blood supply of the appendix is as follows: Anastomosis takes place between the superior mesenteric, ileo-colic, right colic, and middle colic arteries by means of arches, from which secondary loops are given off; from the latter an appendicular branch arises in connection with branches which supply the ileo-cæcal region. This appendicular branch, the essential nutrient artery of the organ, passes along the free edge of the mesentery, giving off branches on its way. In case the mesentery is absent, the artery passes beneath the peritoneal coat of the appendix. In exceptional cases the vessel may pass directly to the tip of the organ, giving off no branches until it is reflected in the sub-mucosa.

The lymphatics of the appendix pass into the appendicular

[1] A Contribution to the Pathology of the Vermiform Appendix. T. N. Kelynack, London, 1893.

lymphatic ganglion, which lies in the angle formed by the appendix and the cæcum (Clado). In the female, lymphatic channels pass along the appendiculo-ovarian ligament, between the folds of the peritoneum which form this structure, and establish communication between the appendix and the ovary.

The nerves of the appendix are derived from the superior mesenteric plexus of the sympathetic nervous system. Filaments from the branch which accompanies the ileo-colic artery pass to the organ. It is to be noted that the superior mesenteric plexus is finally largely distributed to the small intestine. This explains the general dissemination of the pain in the abdominal region in cases of appendicitis.

The location of the appendix, with relation to the cæcum, as well as to the general cavity and its contents, are important to the surgeon at the present time, in view of the fact that the removal of the organ (appendicectomy) has become an operation of frequent occurrence. Turner, of Moscow,[1] has made a careful study of eighty-three cadavers, in which the appendix lay freely in the abdominal cavity, with the following results:

In fifty-one, it hung down in the lesser pelvis.

In twenty, it passed transversely over the psoas muscle toward the sacral promontory.

In six, it lay freely upon the iliacus or upon the psoas.

In two, it passed upward upon the lateral surface of the descending colon.

In three, it lay in the meso-gastric region, with the commencement of the colon lying traversely.

In one, it lay in front of a right-sided sigmoid flexure.

In twenty-two cases in which the appendix lay behind the first portion of the colon, between this and the posterior abdominal wall, its relative position was as follows:

In four, it lay curled up behind the ileo-cæcal junction.

In five, it lay directly behind the cæcum.

In six, it passed intra-peritoneally along the posterior or postero-median surface of the colon.

[1] Chirurgichesky Vestnik, 1892, March and May; Centralblatt für Chirurgie, No. 41, 1892, p. 840.

In two, it passed in the same direction extra-peritoneally.

In four, it passed in the same direction, but only partly extra-peritoneally.

In one, the fundus of the cæcum turned upward and backward, the appendix lying behind it.

Professor J. D. Bryant, of New York,[1] in a study of the direction of extent, location and direction of the appendix, based upon 144 dissections, gives the following tabulated statement. The influence of sex in the arrangement was considered as based upon eighty-six male and forty female cadavers. In eighteen of the 144 cases the sex was not stated.

Direction of the Appendix.	Male.	Female.	Not Stated.	Total.
Inward	20	11	3	34
Behind the cæcum	18	10	4	32
Downward and inward	16	7	5	28
Into the true pelvis	14	3	4	21
Downward	5	0	0	5
Upward and inward	4	5	0	9
Upward and backward	3	0	0	3
Upward and outward	2	0	0	2
Outward	1	1	0	2
Upward along the inner side of the colon to liver	1	0	0	1
Upward outside of ascending colon and cæcum	1	3	0	4
Curled below the cæcum	1	0	0	1
Downward and outward	0	0	1	1
Upward and back of the cæcum and colon	0	0	1	1
Totals	86	40	18	144

Dr. A. T. Bristow, one of my assistants at St. Mary's Hospital, has suggested a simple method of classifying the position and direction of the appendix. It consists in locating a central point in the right iliac fossa, and from this as a centre drawing lines radiating in the different directions that the appendix assumes, and representing its attachment to the cæcum by the above-mentioned central point. The radiating lines are indicated by numbers. I have modified this method by substituting the ini-

[1] Annals of Surgery, February, 1893, page 164.

tial letters of the points of the compass for the numbers. A reference to the accompanying figure, will show the application of the method. The line W. E. is drawn transversely to the median line of the body, and tangentically to the base of the cæcum when in its normal situation. From the point where the cæcum touches this line, the appendix may take any one of eight different directions indicated respectively by the radiating lines W., N. W., N., N. E., E., S. E., S., S. W. (Fig. 7).

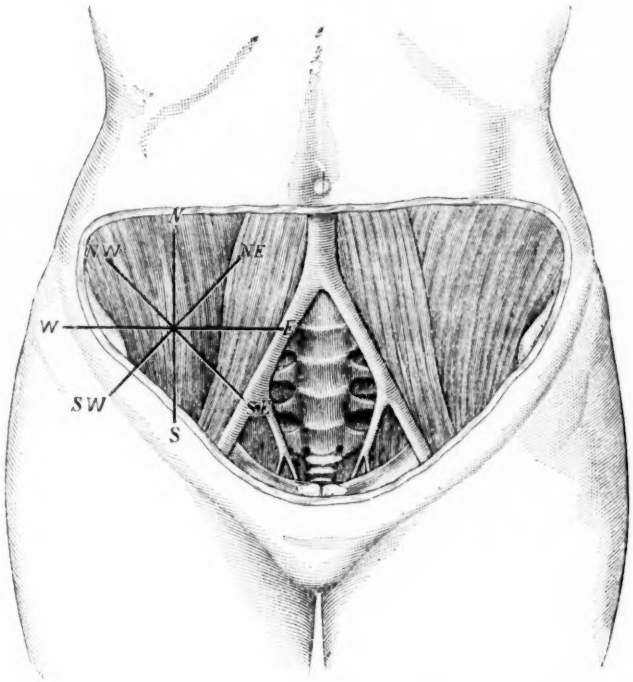

FIG. 7.

Appendices arising from colons abnormally placed form a class by themselves.

The appendix may pass either above or below the transverse line W. E. When above, it may take any one of the three general directions indicated by N. W., N. and N. E. If below the transverse line, it may in like manner take any one of the downward directions indicated by the lines S. W., S. or S. E. It

may also run directly outward in the W. direction, or directly inward in the E. direction. When it takes the N. line it will usually lie behind the colon, although it may exceptionally take this direction anterior to the ascending colon. When the appendix takes the general direction E., if sufficiently long, it may cross both iliac vessels and appear in the left iliac fossa, where its presence may give rise to left-sided appendicitis. If the organ presents a decided inclination toward the anterior or posterior abdominal wall, in either of these positions, the initial V (ventral) in the case of the former, or D (dorsal) in the case of the latter, may be added.

When the direction of the appendix is S. E., it very frequently passes across the vessels into the true pelvis. This point should be borne in mind when a differential diagnosis is to be made between appendicitis occurring in the female and inflammatory conditions of the pelvic organs.

Adopting this method of classification and study, Dr. Bristow[1] reports the following as the position and direction of forty appendices in dissecting-room subjects:

CLASS A. COLON NORMALLY PLACED.

(1) Appendix above the transverse line:
Line N. W., 1; line N., 9; line N. E., 0; total 10.

(2) Appendix parallel with the transverse line:
Line W., 0; line E., 4; total, 4.

(3) Appendix below the transverse line:
Line S. W., 2; line S., 6; not into pelvis, 1; into pelvis, 15; total, 24.

Total number in Class A., 38.

Of these, one appendix, proceeding in the direction E., reached across to the left side, just beneath the linea semi-lunaris; one in the direction of N. just touched the liver.

CLASS B. COLON ABNORMALLY PLACED.

In the pelvis, 1; in the scrotum, 1. In each case the appendix lay behind the displaced colon.

[1] Meeting of the Brooklyn Surgical Society, April 6, 1893.

II. The Inflammatory Lesions of the Appendix.

Definition and Classification.—The inflammatory lesions of the appendix were formerly comprehended under the terms typhlitis, peri-typhlitis and para-typhlitis. Typhlitis was defined as an inflammation of the cæcum itself (Albers); the second indicated an inflammation of the parts immediately surrounding the cæcum (Goldbeck); while the third was used to designate an inflammation of the post-peritoneal connective tissue of the cæcum (Oppolzer). At the present time, thanks to the writings of Fitz, of Boston, and of McBurney, of New York, these diseases are very generally known to be due to lesions occurring primarily in the appendix, and extending thence to the peritoneal investment of the organ or to the post-peritoneal tissue in the neighborhood.

To Grisolle is due the credit of having persistently opposed the teachings of Albers regarding the pathology of these affections. The views of the latter have found their way, however, into almost every text-book in which the subject is discussed since 1839, while the true pathology of the disease, although ably set forth by Grisolle[1] in the same year, was disregarded for more than half a century until brought to light and verified by the American observers just mentioned.

Grisolle contended that simple inflammation of the mucous membrane of the cæcum could scarcely give rise to the grave consequences involved in the phlegmonous inflammatory conditions as they occur in the right iliac fossa, since dysenteric and other well-recognized forms of ulceration of the same structures show no tendency to extend into the neighboring connective tissue. On the other hand, inflammation of the vermiform appendix of the cæcum, followed by perforation, phlegmonous inflammation, and abscess in the right iliac fossa, explained in a rational manner the course of events as they actually took place; moreover, the explanation was verified by investigations carried out in the dead-house. The views of Albers were purely artificial and speculative, while those of Grisolle were based upon accurate anatomico-pathological researches.

[1] Tumeurs phlegmoneuses des fosses iliaques, Archives de Medecine, 1839.

The term "typhlo-enteritis," introduced by Burne, is equally objectionable as being misleading; this writer suggested that the term be applied to inflammation of the cæcum and of the appendix as well.

The term "iliac phlegmon" simply implies one of the sequences of the disease, and in the light of our present knowledge, should also be rejected.

The possible appearance, though as a rare affection, of a genuine "stercoral typhlitis" is still maintained by Lennander. The occurrence of fæcal stasis giving rise to an inflammatory paresis of the cæcum, thus increasing the stagnation of the intestinal contents, and this in turn increasing the resistance offered by the inflammatory conditions, are supposed to be the pathological sequences involved in its occurrence. This view is opposed by Professor Sahle.[1] Unfortunately, abscesses which might be supposed to have their origin in this manner, are simply evacuated, the appendix, in all probability, the cause of the trouble, being entirely disregarded. A case of intestinal obstruction observed by Lennander[2] indicates the possibility of its occurrence, but the question must still be considered *sub judice*.

In view of the prominent part that the appendix takes in these affections, if, indeed, it be not the structure exclusively involved in the primary lesions, it is deemed advisable to discard the terms "typhlitis, peri-typhlitis and para-typhlitis," as well as "typhlo-enteritis" altogether, as applied to the conditions usually met with, and to substitute for all of these the term "appendicitis" when speaking of the disease in a general way. Endo-appendicitis is the so-called catarrhal form, while the name parenchymatous appendicitis (parietal appendicitis) is applied to the variety of the disease usually developed from this by an extension of the inflammation to the sub-mucous connective tissue, and thence to the muscular layers. Ulcerative, gangrenous, and suppurative forms also occur (see pathological anatomy).

For clinical purposes it is convenient to divide the disease into the following-named stages, but the fact is always to be

[1] Korresp. Blatt für Schweitzer Aerzte, 1892, s. 593–611.

[2] Sammlung klinischer Vorträge, No. 75, 1893.

borne in mind that these stages may merge imperceptibly into one another, and that one or more stages may be absent altogether.

First Stage.—*Endoappendicitis.*—In this stage a more or less intense inflammation of the mucous membrane and sub-mucosa occurs. The attack may advance no further than this stage. It corresponds to the stage of "appendicular colic," as described by Talamon,[1] and covers a period of about twenty-four hours. Talamon states that this stage is ordinarily prolonged from two to three days, and that it covers the period of the engagement of a stercoral calculus in the appendix. This is probably an error. I have more than once performed appendicectomy during the first forty-eight hours of the existence of the disease, and have never found evidences of this engagement of a coprolith at the cæcal orifice of the appendix. On the contrary I have frequently failed to find even soft fæcal masses within the appendix. Usually the most indubitable evidences of endo-appendicitis, parietal appendicitis, or periappendicitis, or all three, are found even at this early period.

While it is true that this stage may only represent a so-called catarrhal inflammation, many physicians make the error of considering the condition as one of slight importance. In addition to the fact that the disease may run through all four stages within three days, and the first three stages within forty-eight hours, there are especially dangerous conditions that may supervene, or accidents which may occur, even when the inflammation seems to be limited to the mucosa and sub-mucosa.

The first of these dangers is the occurrence of constriction of some portion of the tube by the swelling of the mucous membrane, and of the sub-mucous connective tissue. The parts first involved in the inflammation advance the most rapidly to the stage of engorgement and infiltration. As a result of this a constriction of the lumen of the appendix occurs, at one or more points, the effect of which is to imprison within what is now practically a closed cavity, the mucus resulting from the hypersecretion of the inflamed mucous membrane, together with what-

[1] Appendicite et Perityphlite par Ch. Talamon, Paris, 1892.

ever fæcal matter there happens to be within the tube. As a further complication of this stage the pressure effects of the infiltrated connective tissue spaces of the sub-mucosa from without, and the accumulated secretion from within, should not be lost sight of. The appendix, like other vestigial structures in the animal economy which have ceased to functionate as a result of evolutionary changes, possesses but slight vital resistance. Interference with its blood supply to an extent which, in other organs would be of but minor importance, here produces the most disastrous consequences. These include necrosis of the mucosa, which invites rapid bacterial infection of the walls of the appendix, ulcerative destruction of a circumscribed character, and this in its turn leads to a perforation from the presence of accumulated and retained mucus and muco-pus; finally gangrene of a portion or of the whole of the organ may develop.

Gangrenous inflammation may likewise result from a direct occlusion of the nutrient vessels of the body of the organ. As a result of an infection of the sub-mucosa an endarteritis or phlebitis, having their origin from the paravascular connective tissue spaces, occurs; the endothelial lining of the vessel then becomes roughened and thickened, and a stasis thrombosis follows. Certain anatomical peculiarities of the vessels themselves may favor the production of the gangrenous condition. For instance, it may happen that but a single nutrient artery exists, and that this may not give off any branches before reaching the tip of the appendix, being there reflected upon itself in the sub-mucosa. This condition was found to exist in one of my cases: a stasis thrombosis of septic origin occupied the lumen of the vessel at a point about one-third of the distance which the vessel traversed from the tip to the base of the organ. Endoappendicitis, engorgement of the vessels of the mucosa, capillary stasis, necro-biological changes in the mucosa, infection of the sub-mucosa, endarteritis and thrombosis were all found to have taken place within ten hours following the first symptom of the disease. Under these circumstances the primary inflammatory lesion occurs in the peripheral portion of the organ, and the occlusion of the vessel takes place at this point; following this a gan-

grenous condition will supervene in the portion of the appendix lying between the point of occlusion and the base, since there is no other blood supply save through the reflected trunk.

SECOND STAGE.—*Parietal Appendicitis.*—This stage is characterized by an inflammatory process, whose seat is in the interstitial or intermuscular structure of the body of the appendix. It is analogous to the corporeal metritis of the gynæcologists. It presents in its simplest form an ordinary serous inflammation, with engorgement of the vessels, and the presence of an exudate in the perivascular spaces. The infection may take place through the sub-mucosa or through the lymphatic channels leading directly from the mucous membrane. As a result of circulatory disturbances (endarteritis obliterans), one or more circumscribed points of ulcerative action may develop, involving both the mucous lining and the peritoneal investment, and leading to perforation. Or from interstitial pressure strangulation may occur in addition, and complete gangrene of the organ may follow.

Again, suppurative inflammation may occur in parietal appendicitis in the form of a rapidly spreading phlegmonous inflammatory process or several circumscribed points of suppuration the result of septic embolism. In this manner several foci of suppuration may make their appearance simultaneously.

THIRD STAGE.—*Peri-appendicitis.*—A further step in the pathological process involved in this disease consists of an infection and consequent involvement in the inflammatory process of the peritoneum which invests the appendix. The limitation of the peritoneal infection to that portion of the serous membrane which covers in the organ, with the occurrence of adhesions between the appendix and the serous surfaces immediately adjacent, mark the boundaries of this stage.

FOURTH STAGE.—*Para-appendicitis.*—In this stage the most serious consequences, arising from the presence of the disease, manifest themselves, although the dangers of the affection, as we have already seen, are by no means limited to this period. Following the formation of adhesions, infection of the fibrino-plastic exudate constituting these may take place either through the lymph channels of the appendix from perforation of the walls of

the latter and infection from the walls of the tube, or by direct infection from one or more of the foci of suppuration in the walls of the appendix. Thus it may happen that, upon opening into an appendicular sero-purulent collection or abscess, the result of a para-appendicitis, the appendix may be found either perforated or intact.

Para-appendicular abscess, arising from suppurative inflammation in the retro-peritoneal connective tissue with which the uncovered portion of the appendix comes in contact, in cases where the organ is extra-peritoneally situated in whole or in part, also occurs in this stage of the disease.

Infection of the retro-peritoneal connective tissue, or of the mass of adhesions, or of both, in either of the ways above described, results in the occurrence of a suppurative inflammation within these. The suppuration may be limited to the adhesions themselves, and remain distinctly circumscribed, or it may assume a spreading, phlegmonous character here, as well as in the retro-peritoneal connective tissue. In the first instance, the formation of a sero-purulent collection; in the second, an abscess occurs with limiting walls, beyond which the peritoneal surfaces remain comparatively healthy (the "iliac phlegmon" of the older writers). With the formation of a spreading or phlegmonous inflammation the case is different. Here one of three things may result: First, a diffused peritonitis may take place, from septic infection, though the serous effusion following this need not necessarily become purulent. Second, a general suppurative peritonitis may occur from pyogenetic infection of the serous effusion. The *bacterium commune coli*, which, under certain circumstances, assumes pathogenetic properties and may even become exceedingly virulent, finds its way to the seat of the effusion through the usual channels of infection. In all probability this micro-organism is itself the infective agent which produces both the appendicitis and the peritonitis. The serum at once becomes a culture medium for the bacterium, and as a result of this a rapidly progressive suppurative process develops, followed by general septic infection. Third, secondary, encysted intra-peritoneal foci of suppuration may form. Here a serous effusion may

occur beyond the limits of the original para-appendicitis, from localized peritonitis, due to indirect or lymphatic infection. The serum subsequently undergoes suppurative changes.

It should be stated, in passing, that the occurrence of septic peritonitis, either diffused non-suppurative, diffused suppurative or intra-peritoneal and encysted, is not necessarily limited to the fourth stage, or deferred till the formation of adhesions. From the first appearance of an endoappendicitis, channels of infection are opened which may lead to the occurrence of any one, or of all of the forms of septic peritonitis, without the occurrence of perforation, formation of adhesions or rupture of a sero-purulent collection or an abscess cavity.

The term "para-appendicitis" is sometimes employed to designate suppurative inflammation of the connective tissue adjacent to that portion of the appendix which is not covered with peritoneum, when this anatomical condition exists. Inasmuch as this condition is exceptional, while suppurative inflammation of the connective tissue and inflammatory new formation about the appendix is of very common occurrence, the term is here employed as a convenient one to designate both conditions. In the case of the connective tissue, ordinary pus is produced, while in the case of the mass of adhesions, an intra-peritoneal sero-purulent collection results.

Circumscribed inflammatory processes within the peritoneum do not, as a rule, show the same tendency to spread from the very beginning as do those occurring extra-peritoneally. In the case of the latter the entire plane of connective tissue of the dorso-lumbar region may become rapidly infected. As a result of this lumbar phlegmon, subphrenic abscess and para-nephritic abscess arise from lesions of the appendix.

In pursuing the study of the clinical history of the disease, it becomes at once apparent that it presents itself with different degrees of severity, from the acute form on the one hand, the different stages of which have just been discussed (the hyperacute form of Talamon), to the subacute form on the other, with its slight febrile action and moderate abdominal pain and tenderness. In addition to these, there are different phases of the disease to

be noted clinically. These consist of the recurrent form, and of the chronic form, which in its turn may lead to the relapsing variety.

The Ætiology of Appendicitis.

The ætiology of inflammatory suppurative conditions in the neighborhood of the right iliac fossa was supposed in former times to involve the presence within the appendix vermiformis, of cherry-stones, grape-seeds, lemon- and orange-pits, date-stones fish-bones, pins, etc. This idea was so firmly fixed in both lay and professional minds that children were carefully watched while eating fruit to prevent them from swallowing a stone or seed, which, it was believed, would lodge in this "death trap," as it was popularly called, and produce what was at that time considered an almost necessarily fatal malady.

This belief seems to have been based upon evidence which is deemed insufficient by scientific men of the present day, although it is not to be denied that traumatic appendicitis may occur. The following instance reported by M. Mustivier, as far back as 1759, the account of which is borrowed from Talamon, may have served, like the pathology of the disease as set forth in Albers, as a basis for the writings of subsequent authorities:

A man, forty-five years old, was admitted to the Hospital St. André de Bordeaux, suffering from a fluctuating tumor in the umbilical region to the right of the median line. The tumor upon being opened discharged a pint of pus. A fatal termination took place, and at the autopsy a pin was found, encrusted with earthy matter, which had served as the starting point of the disease by perforating the appendix vermiformis cæci.

There can be no question in this instance of the origin of the condition; but this case was not one of appendicitis, as we now view it. A similar condition might have followed the passage of the pin through any portion of the intestinal wall. Even the presence of the "earthy matter" need not necessarily have prevented the point of the pin from perforating the walls of the appendix.

The belief that the disease is frequently due to the engage-

ment of foreign bodies in the cavity of the organ, is based to a large extent upon purely speculative or imaginary conditions, or erroneous observations. In an exceptionally large experience in the operative treatment of this disease, in but two instances was any body found other than soft fæcal masses, which could be construed as being in any sense "foreign." One of these two was a true enterolith, oval in shape, and made up of calcareous salts, arranged in concentric layers (Fig. 8); the other was a gall-stone. The exceptionally rare character of the foreign body in this latter instance, will perhaps warrant a detailed account of the case. It is further interesting from the fact that it approaches nearer than any case with which I have been brought in contact, to the cases of so-called appendicular colic that Talamon has

FIG. 8.

described; these he employs as a basis upon which to build up the theory that hardened fæcal matter forced into the "musculo-membranous tube" is a prominent cause of appendicitis.

CASE LXI.—The patient, an upholsterer by trade, was brought into St. Mary's Hospital on August 15, 1891, with the following history: On July 8, while hanging shades, he swallowed a small nail, such as is used for fastening the shade to the roller. Upon the same day he suffered from an attack of sharp pain in the right hypochondriac and epigastric region, which required full doses of opium to allay. This was thought by his medical attendant to be in some manner connected with the presence of the nail. This attack subsided, and ten days later another accession of violent abdominal pain occurred, which finally settled in the right iliac fossa. Upon his admission a tumor was found in the right iliac fossa. A laparotomy revealed an abscess cavity, containing six ounces of pus, during the evacuation of which a gall-stone, the size of the tip of the little

finger escaped. Further exploration revealed the fact that an appendicitis existed, the cause of which was evidently an attempt on the part of the gall-stone to enter the cavity of the appendix. This was shown by the sloughing away of the appendix from the cæcum at the point of its attachment. A ragged hole in the cæcum, with gangrenous margins, occupied the site of the base of the appendix, which could be felt as a hard, rounded, elongated, rope-like body, lying in a mass of adhesions in the southeast position.

In this case it is evident that the gall-stone was the cause of the appendicitis. It had lodged directly at the appendicular orifice. Its roughened exterior had probably produced an abrasion of the epithelial lining of the cæcum, and necrosis of the mucous membrane had taken place. This in turn was followed by an infection of the sub-mucosa. The occurrence of gangrene, causing the separation of the appendix from the cæcum, may be explained either by the persistent pressure of the gall-stone or by the accidental occurrence of thrombo-stasis, due to occlusion of the nutrient artery. The presence or absence of a mesentery for the appendix could not be ascertained.

In all probability the notion that cherry-stones, lemon- and orange-pits or date-stones are largely responsible for the occurrence of the disease is based upon the fact that little masses of fæcal matter, which have been moulded into shapes accurately representing these bodies in size and shape are found during the evacuation and irrigation of an appendicular abscess. It has happened more than once during an operation of this character at my hospital clinic that one or another of the bystanders has exclaimed, as the little mass of fæcal matter came into view, "a lemon-pit!" or "a date-stone!" so strong a resemblance was there between these masses and the bodies mentioned. In every instance, however, the fact that they were, with the above-mentioned exceptions, made up of molded fæcal matter was demonstrated by simply flattening them out between the thumb and finger.[1]

[1] The possibility of the production of the disease by foreign bodies is not denied; the statement is simply made that, as a clinical fact, in my experience it is of rare occurrence.

Beyond the little masses of fæcal matter which become imprisoned in the cavity of the appendix by the occurrence of constriction, either at the point of communication with the cæcum or at some other portion of the tube, nothing in the shape of a foreign body, other than those above-mentioned, has been found in my experience to account for the conditions present. The ease with which fæcal matter may maintain its position in the cavity of the appendix may be easily understood when two facts in the anatomy of the organ are borne in mind. These are, first, the fact that it normally occupies a dependent position in the large majority of cases; hence, gravity alone will aid the passage of fæcal matter into its interior, and also favor its retention there. Second, the absence of well-marked circular muscular fibres gives rise necessarily to a very feeble expulsive power. Hence, it may be said that the appendix vermiformis does not have that inherent power of emptying itself which other hollow organs, supplied with longitudinal and circular involuntary muscular fibres, combined in proper proportions, possess. In addition, anatomical studies and clinical experience (examinations made of healthy appendices during laparotomies) unite to support the assertion that fæcal matter is found in a considerable number of appendices in individuals who had never suffered from the symptoms of appendicitis. The mere presence of masses of fæcal matter, therefore, cannot be looked upon as necessarily producing the disease, even though these become more or less hardened by inspissation. This hardening process takes place after their imprisonment, and is due to absorption of the watery elements after the escape of the fæcal matter itself is cut off. In this condition they may, by their presence, produce in an already inflamed and partially devitalized organ, ulcerative changes, or even extensive gangrene, by still further interfering with the normal circulation. That they do not necessarily give rise to the disastrous perforation which is so frequently a marked feature of the disease is shown by the fact that they are not always present when this accident occurs. When they are present they are rarely found at the point of ulceration, but are located, in the great majority of cases, either above or below the

site of the perforation. Moreover, cases are observed in which the entire outer structure of the appendix has sloughed away as a result of a violent inflammatory process, leaving the mucous membrane as an intact blind sac with fæcal matter in its interior. The following case, occurring in my hospital service, will illustrate this condition:

CASE LVII.—H. T., aged eighteen, male, was admitted to the Methodist Episcopal Hospital with the history of having been attacked seven days previously with the usual symptoms of appendicitis. General peritonitis was present and the patient's condition was very unpromising. The usual right-sided laparotomy revealed the remains of the appendix in the shape of a worm-like tube, consisting exclusively of the mucous lining of the organ. This was not perforated, although at a point midway between its tip and the place of its attachment to the large intestine its lumen was occupied by a rather hard fæcal concretion (Fig. 9). The walls of the organ had sloughed completely away. The cavity of the peritoneum contained a large amount of sero-purulent material.

FIG. 9.—The intact mucous lining of an appendix, the outer walls having sloughedaway, showing a coprolith in position.

How much the presence of fæcal matter, independent of its mechanical effects, may influence the origin of the inflammation is yet to be determined. The fact that fæcal matter of itself does not necessarily give rise to the disease is, to my mind, sufficiently proven.

In all probability it will be found that the inflammation has its origin in noxious agents which are conveyed to the interior of the organ in the fæcal matter when the latter is present. These agents are not always present in fæcal matter, and may find their way into the tube without the aid of the latter. The micro-organisms having their natural habitat within the colon, notably the variety known as the *bacterium commune coli*, may assume a pathogenic rôle when they escape from the colon. In

one of my cases a pure culture of this bacterium was obtained from a layer of plastic lymph which glued the inflamed appendix to the cæcum. The mucous membrane of the organ, however, was not involved in the inflammatory process, and sections of its walls failed to reveal the presence of the micro-organism.

Pure cultures of the *bacterium commune coli* can be obtained from the peritoneal surface of an inflamed appendix, which has not undergone perforation, as well as from the walls of the organ and the interior of its mucous canal. This has been accomplished by one of my assistants, Dr. A. T. Bristow, who has also obtained for me pure cultures from the contents of an appendicular abscess, and from both isolated and non-encysted intra-peritoneal collections of fluid. These observations were made upon cases operated upon by myself, taken at random from my hospital service, and were commenced in September, 1892.[1]

The pathogenic power of the *bacterium commune coli* derived from both the contents of the dilated cavity of an appendix the seat of a rapidly developed inflammation, as well as the comparatively unaltered portion of the organ, is illustrated by the following case:

CASE 142.—M. S., aged twenty-seven, was attacked with the usual symptoms of appendicitis. I removed the appendix thirty-two hours after the commencement of the attack. The organ was the seat of a so-called cystic dilatation, the distal two-thirds of the organ, which was four inches in length, being distended by a stenosis at this point, while the proximal portion was but slightly enlarged beyond the normal. In removing the appendix the section was made between two ligatures. The specimen, upon examination by Dr. Wilson, at the Hoagland Laboratory, gave the following result:

Cultures made from the proximal portion of the organ developed the *bacterium commune coli* in pure culture. Cultures made from the distal, or dilated portion likewise developed the same bacterium alone. The cultures were plated and bouillon cultures made from isolated colonies. The bouillon cultures, when twenty-four hours old, were injected into the peritoneal cavity of guinea pigs. The injections caused death in twenty-four hours. The bacillus was recovered

[1] The New York Medical Journal, Vol. LVIII, October 14, 1893, page 434.

in pure culture from the exudate in the peritoneal cavity. Very few organisms were found in the organs, and death was due rather to toxæmia than to peritonitis.

No foreign body or fæcal matter was found in the appendix.

Evidence is constantly accumulating which shows that the common bacillus of the colon is not always an innocent micro-organism. It may pass the barrier of the intestinal mucosa (although under proper conditions it may also set up an active desquamative process here), and penetrate into the general circulation, producing disturbances in a wide variety of organs and virulent toxic effects upon the system at large. It has been found by Wyss in a case of enlarged spleen; by Larulle, Roux, Rodet and A. Fränkel in suppurative peritonitis; by Tavel in a hematoma following thyroidectomy; by Gilbert, Girode, Naunyn and others in diseases of the biliary passages; Rodet, Veillon, Jayle, Stern and A. Fränkel found it in abscess of the liver; Levy demonstrated its presence in lymphangitis of the arm; and Chiari found it in a case of septic emphysema in a diabetic patient. Stern discovered it in a case of general pyemic infection, with suppurative meningitis. Lasage and Maxime Macaigne have found it in the stage of reaction of cholera. Its existence has been shown in cholera infantum, dysentery, broncho-pneumonia, endocarditis, meningitis, nephritis and cystitis by the labors of Henkemaus.[1] Welch noted its existence in cases of peritonitis consecutive to an intestinal lesion without perforation.[2] This latter observer believes that the micro-organism does not necessarily possess nor assume pathogenetic characteristics so long as it is brought in contact only with sound mucosa, but that following almost any lesion of the intestine it becomes migratory. My own experience accords with the observations of Veillon and Jayle, *i. e.*, that Escherich's *bacterium commune coli* can produce not only inflammatory lesions, but suppuration as well.[3] Roswell Park has found this micro-organism in cases

[1] Zur Kentniss der pathogen Wirkung des Colon-bacillus beim Menschen; R. Stern (Breslau); Deutsche Medicinische Wochenschrift, No. 26, 1893.

[2] American Journal of the Medical Sciences, November, 1891.

[3] La Sem. Med., 1891; Centralblatt für Bacteriologie, Band IX.

of the acute perforative, of the gangrenous and of the recurrent varieties of appendicitis.[1]

The experiments of Ekehorn[2] seem to establish with reasonable certainty an ætiological relation between the presence of the *bacterium commune coli* and appendicitis. This writer details a number of experiments upon lower animals with cultures of the micro-organisms derived from cases of the disease, in which not only was their pathogenetic rôle demonstrated, but some of the experiments tended to show that, in comparatively mild forms of the disease (recurrent and chronic relapsing cases), the virulency of the bacterium was not as great as shown by its effects upon the lower animals following inoculation, as cultures derived from acute and rapidly progressive instances of the disease.

Dr. Eugene Hodenpyl, of New York, has recently made a very careful study of the ætiological relations of bacteria to appendicitis.[3] This study is based upon the bacteriological examination of eleven cases of exudative appendicitis, which he has personally investigated, and of sixteen cases reported by others. Of these twenty-seven cases, in which a careful bacteriological examination of the exudate was made, in twenty-five the *bacterium commune coli* was the only species of bacteria found. In one of his cases, associated with the *bacterium commune coli*, a few colonies of streptococcus pyogenes developed on the agar plates. In a single case, reported by Welch, the streptococcus pyogenes was the only bacterium contained in the exudate.

Hodenpyl regards this germ to have been the cause of the lesions in twenty-five of these twenty-seven cases, and brings forward very conclusive evidence in support of this opinion. He obtained on cultivation from the contents of twenty appendices (both normal and pathological), pure cultures of the *bacterium commune coli* in nineteen cases. In one case colonies of streptococcus pyogenes were also discovered. It appears that the interior of the appendix in still-born children is sterile.

[1] Annals of Surgery, September, 1893.

[2] Bacterium Coli Commune, en orsak till Appendicit, Upsula Läkere. Förh., 1892–3, XVIII, 113–150.

[3] Dr. Hodenpyl has very kindly placed the results of his observations at my disposal. His article, containing an account of his investigation, is still in press.

He finds upon investigation (ten cases) that no bacteria of any kind are present in the healthy peritoneal cavity.

Regarding the pathogenic power of *bacterium commune coli*, he gives strong, positive evidence, which he divides under two heads: (*a*) The fact that it has been found in a great variety of lesions elsewhere unassociated with any other germ; and (*b*) the positive results of experiments on animals with pure cultures of the germ.

It is his belief that while this germ in the intestinal canal under normal conditions is entirely inert, when it escapes into tissues where it does not naturally belong, or when the natural conditions become altered, it may assume pathogenic characters, differing in the different cases.

While in exceptional cases exudative appendicitis may be caused by various species of bacteria, it is caused in the majority of cases by the escape into and through the walls of the appendix of the *bacterium commune coli*, which this organ constantly harbors in its lumen.

As predisposing causes to the disease may be mentioned actinomyces and tubercular and typhoid ulcers. The influence of fæcal concretions has already been referred to. Actino mycotic appendicitis has been observed by Ransom[1] and by Otto Lanz.[2] The occurrence of occlusions of the lumen, either partial or complete, are likewise predisposing factors. According to Hodenpyl, these occlusions may be the result of former inflammatory changes, but are more frequently the result of retrograde evolution which this organ seems to be gradually undergoing.

The invasion of the mucous membrane, and of the submucous layer of connective tissue as well, by micro-organisms which are possibly harmless so far as the mucous membrane of the colon is concerned, but are disease-produciug in the mucous membrane of the appendix, at all events, will account for all of the phenomena of the disease. The normal epithelial lining of an organ, useless in the animal economy, and which is probably undergoing evolutionary changes tending towards its final dis-

[1] Proceedings of the Royal Med. Chir. Soc., London, 1891–2, S. IV, 14.

[2] Korrespondenzblatt für Schweitzer Aerzte, 1892, No. 19.

appearance, may be found by the histologist to have already been subjected to changes which distinguish it from that lining the cæcum, and which may have robbed it of its function as a barrier to bacterial infection. Among these evolutionary changes a progressively lowered vital resistance would naturally be the first departure, so far as the tissues are concerned, and this alone would favor violent inflammatory alterations, though the same etiological factors would not be sufficient to produce these effects in the colon or ileo-cæcal region. It has been suggested that the difference in the lumen of the cæcum and appendix may account, to some extent, for the immunity of the cæcum and the susceptibility of the appendix. It is easier to produce abrasions in a small tube than in a large one, and the mucosa once deprived of its epithelium easily becomes infected by micro-organisms.

The conclusion is, therefore, irresistible that infection is not only the principal and necessary cause of the appendicitis, but that it is also the primary cause. Some infectious material enters the appendix, and there becomes fixed as a result of the very inefficient expulsive power of the organ. The secretions of the appendix furnish excellent soil for the development of the micro-organisms. The degree of virulence of these organisms will govern the violence of the inflammatory catarrhal attack if other conditions, such as the existence of stenosis of the canal, or the presence of concretions, are favorable. The ease with which the disease may become chronic is due to the fact that the tissues of the organ are being continuously fed by constantly proliferating infectious material and its toxic products. With any increase of virulence there occurs a renewed or acute attack. Whatever fæcal matter, either fluid or solid, chances to be present plays but an accidental rôle. It is not even necessary that these fæcal masses should produce either ulceration or even abrasion of the mucous membrane. As a matter of fact, their physical qualities are usually such as render it altogether probable that they produce no primary lesion, but that in their soft condition they may remain for an indefinite period of time within the tube without doing harm. That fæcal masses do occur within the

cavity of the appendix vermiformis without the occurrence of inflammatory processes is proven by the frequency with which their presence is noted in post-mortem examinations, as well as in laparotomies performed for other conditions.

The *bacterium commune coli* is the bacterium found in the intestinal canal with the greatest frequency. It has already been shown (*vide supra*) that under certain conditions this is a pathogenetic micro-organism, hence when it is found in pure cultures in cases of appendicitis it may with reasonable certainty be looked upon as the cause of the disease.

The pyogenic staphylococcus and streptococcus may also be present in the pus and in the sero-purulent fluid found in appendicitis, if these have been taken in with the food, and have escaped the action of the digestive fluids. This is probably of rare occurrence. Dr. E. H. Wilson, pathologist to St. Mary's Hospital, found in a specimen of fluid from an encysted intra-peritoneal focus taken from one of my appendicitis cases, and within the cavity of the appendix taken from another case, the *bacillus pyogenes fetidus* in addition to the *bacterium commune coli*. Bouillon cultures of the *bacillus pyogenes fetidus*, derived from the latter source, injected into the peritoneal cavity of a guinea pig, produced death within twelve hours from a profound toxæmia. This organism was recovered from the exudate in the peritoneal cavity of the animal.

The relation of the blood supply to the occurrence of the disease has led to a critical study and review of the conditions which govern this supply. These studies have been principally directed to the presence or absence of a mesentery connected with the organ. So far as I have been able to judge, from the examinations made of appendices removed in a diseased condition, the disease occurs quite as often in those individuals in whom a well-formed and vascular meso-appendix is present as in those in whom the mesenteric attachment is but slightly developed or altogether absent.

The study of the clinical anatomy has not, to my knowledge, been heretofore undertaken. The shape and relative position of the appendix as found in individual cases may favor

the development of the disease. Thus, an angulated or exaggerated curve-shaped appendix may favor circulatory disturbances, and a directly vertical position with the tip downwards the engagement in the orifice of hardened fæcal matter, which, acting as a local irritant, leads to the development of the disease. The absence of anything like uniformity in its relation and direction under conditions of both health and disease, however, rather tends against the relation of the above-mentioned conditions as ætiological factors except in a casual or predisposing manner. While, therefore, these will explain the occurrence of certain symptoms in some cases which are absent in others, they cannot be looked upon as essentially ætiological factors in the disease.

The condition of the bowels prior to the attack has been the subject of considerable study in connection with the disease. The only conclusion which can be drawn is that neither preceding constipation nor diarrhœa occurs in a sufficiently large number of cases to stand in a causative relation to the disease; and that a normal condition of a daily movement of the bowels is observed in the majority of cases.

The influence of age upon the occurrence of the disease is of importance. The affection is not confined, by any means, to the age of childhood as was formally supposed; yet its somewhat greater relative frequency in early life has led to the opinion that age is one of the predisposing causes. It is rare at the two extremes of life. The comparative frequency, in my experience, of the diseases at the different periods of life, agrees essentially with the observations of Bamberger, Paulier and Maurin, as given by Talamon, and of Reginald Fitz, to whom the profession is greatly indebted for a large number of accurate observations upon the disease.

The influence of sex upon the occurrence of the disease has been studied by Bamberger (1864), Volz, Marchal, Paulier (1875), Fitz (1886 and 1888), and Maurin (1891). Taking the total number of cases of these observers, and combining them, the following result is obtained:

Total number of cases observed	557
Total number occurring in males	430
Total number occurring in females	113
Percentage occurring in males	80
Percentage occurring in females	20

In my own experience, about the same proportion of males to females was observed.

Among the occasional causes laid down by writers, traumatism is mentioned. In my experience, not a single instance occurred in which a kick or a blow upon the abdomen or a fall constituted a portion of the history. The nearest approach to this is the case of an ice-man, who attributed the attack to a strain he had received the day before in lifting a heavy block of ice from his wagon. Another instance is that of an athlete in whom the disease developed during the night after he had engaged in a game of football. In neither of these cases does it seem to me that the violent effort or exercise bore any causative relation to the attack of appendicitis.

Indigestion has also been regarded as one of the determining causes of the attack. This belief has probably arisen from the frequency with which vomiting and pain, referable to the epigastrium, are prominent symptoms of the first stage of the attack. These symptoms, as has already been insisted upon, are not due to digestive disturbances, as a rule, but are purely reflex phenomena. It rarely happens that undigested food is vomited, and the movements of the bowels following upon an attack of appendicitis do not show evidences of irritating ingesta. It is common enough to have patients declare that they must have eaten something which disagreed with them, but so far as my experience goes I have failed to trace an ætiological relation to such a cause even by careful questioning, save in but a single instance (*vide infra*). Talamon, however, believes that the erratic peristalsis produced by the presence of irritating material alone within the digestive tract determines the engagement of a stercoral calculus in the orifice of the appendix. This in its turn gives rise, according to this observer, to the symptoms here described as constituting the first stage of the disease.

In the rare instances in which the digestive disturbance seems to precede the development of the disease, the connection between the two occurrences may still be dependent upon bacterial agency. It has been shown by experiments upon animals that cultures of the *bacterium commune coli* derived from patients the subjects of diarrhœal diseases possess far more virulent toxic properties than those taken from healthy individuals.[1] Whether the catarrhal inflammatory conditions present in these diseases, and which, to a greater or lesser extent, are present in those attacks commonly regarded as the result of indigestion, and the increased virulency is due to the irritating ingesta which produced the indigestion, or whether, in the life-history of the bacterium, the virulence occurs as a part of the biological changes which it undergoes, this, in its turn, acting as the irritating or infectious agent, has not as yet been determined. If the former it may readily be supposed that an attack of indigestion, by producing certain changes in the intestinal tract and converting the theretofore harmless micro-organism into one of greater or lesser virulency, would stand in a causative relation to the disease. In this connection the following case will be of interest:

Case XXIX. M. B., aged forty-seven, with no history of a previous attack, and of previous regular habit of bowels, dined at a cheap restaurant, which was not at all his habit, making a hearty meal of pork and cabbage. He was attacked the same evening (December 15, 1889) by pains, referred to the epigastrium, with vomiting. Pain in the right iliac region developed four hours later and tenderness in the latter region was present upon the following day. The vomited material consisted of the partially digested food of the above mentioned meal. I saw him on the fifth day, at which time a tumor was present. An incision made into the latter, evacuated about five ounces of sero-purulent material from a cavity formed by adhesions about the inflamed appendix. The latter lay in the N. E. position, and was evidently a portion of the limiting wall of the abscess cavity in that direction. For this reason the organ was not removed.

The patient made a good recovery, but on November 19, 1892, nearly three years later, he dined, under the same circumstances, at

[1] Macaigne, Le Bacterium Coli Commune, Paris, 1892.

the same restaurant, and partook of the same character of meal. The same evening he was attacked with pains and vomiting; the pain finally centered in the right iliac fossa. The vomited material showed partially digested pork and cabbage. Within thirty-six hours of the commencement of this attack primary perforation and septic peritonitis had taken place, shortly after which I saw him and operated. The appendix was removed and it was found to have been the seat of a rapidly suppurative process; extreme dilatation had taken place and rupture of its contents into the general peritoneal cavity followed. The patient was a diabetic, with low powers of vital resistance. It is interesting to note that the appendix, at the second operation, lay in the S. E. position.

In spite of the fact that the terms "typhlitis" and "perityphlitis" have been virtually abandoned, for the reason that, whatever the origin of the inflammation, the involvement of the appendix contributes most largely to the dangerous character of the affection, it is still thought by careful observers that the disease not infrequently has its starting point in a catarrhal inflammation of that portion of the cæcum corresponding to the point of communication between the latter and the appendix. Kümmel[1] still insists that the chronic relapsing form of appendicitis has it origin in inflammatory catarrhal processes within the cavity of the cæcum, being propagated thence by continuity of tissue to the interior of the appendix. The secretion of the latter continues to empty into the colon until the point of communication is closed by swelling near the orifice, or by stenosis elsewhere. This view is also held by Iversen, and is supported by the frequency with which strictures of the vermiform process are observed in the relapsing form of the disease. In this variety, too, perforation is the exception, and not the rule. While a mild inflammatory process at this part of the cæcum may pass away without the occurrence of symptoms sufficient to call attention to its presence, the occurrence of even a slight catarrhal inflammation of the appendix leads to constriction of the tube, the retention of secretion and to the formation of coproliths.

To sum up, therefore, the disease may be due, first, to infec-

[1] Archiv. für klinische Chirurgie, Vol. LIII, 3 and 4.

tion from the presence of the *bacterium commune coli* or some other micro-organism; second, to circulatory disturbances, more or less readily produced by sharply curved or angular shapes of the organ, or a deficient blood supply; third, to the presence of accidentally imprisoned fæcal matter, which is prevented from returning to the cæcum both because of the feeble expulsive power of the tube, due to an insufficiency or entire absence of circular muscular fibres, and on account of constriction of the tube which may or may not be due to previously existing inflammation. This fæcal matter, because of bacterial infection which it conveys to the parts, or from the pressure effects due to inspissation, or both, contributes to the ætiology of the disease in its entirety, but particularly in the cases in which perforation takes place. Bacterial infection, however, may occur independently of the presence of fæcal matter, and the presence of fæcal concretions is not at all essential to ulceration, perforation or gangrene.

Special Types of Appendicitis.

Special types or varieties of the disease are sometimes observed, differing from the affection as already described. Even in these cases, almost without exception, there can be obtained a history of the first, second and sometimes of the third stage of an average acute attack. From this point, however, the symptoms seem to veer off, as it were, from the typical course, only to return to it after a greater or lesser length of time.

The forms now to be considered are the subacute, the chronic, the relapsing and the recurrent varieties.

Subacute Appendicitis.—The *subacute* variety is not to be looked upon as an innocent form of the disease. Although the febrile action is slight, and the pain and tenderness such as occasion no alarm, these insidious symptoms may be replaced, without warning, by those indicating the occurrence of perforation, and suppurative or non-suppurative septic peritonitis; or the latter condition, as already stated in discussing the acute variety, may come on without perforation. The subacute form may supervene upon the acute variety. Convalescence may follow this remission of the symptoms, but the change from an acute

to a subacute form is only too often more apparent than real, and leads to a sense of fancied security on the part of the physician and patient, to be followed by the occurrence of one or more of the grave accidents which only too frequently mark the further progress of the disease. This was strikingly exemplified in the case of Gambetta, the celebrated French journalist.

Chronic Appendicitis.—Where the affection stops short at the first stage, or perhaps even recedes more or less from this to a stationary but persistent condition of subacute endoappendicitis, it is said to have assumed a chronic phase of the disease. The mucous membrane, and perhaps in addition, the submucous connective tissue, persists in a condition of subacute inflammation, from which one or more relapses may occur in the course of a few weeks. The patient may become seemingly convalescent, in that pain and all febrile symptoms disappear. He may even be permitted to resume his avocation. Within a few weeks, or even earlier, a relapse takes place, with symptoms perhaps more violent and threatening than at first. There is one symptom, at least, which does not entirely disappear, and its presence should always place the attendant upon his guard against this form of the affection. I allude to the symptom of persistent tenderness. This is sometimes accompanied by the presence of a tumor, although the latter is not an essential symptom of this type of the disease.

Cases are sometimes observed in which the symptoms are from the beginning indicative of a subacute condition.

Recurrent Appendicitis.—This form of the disease is not rare. A certain proportion of cases occurring in adults will give a history of previous attacks, one or even more in each year. These cases are to be distinguished from the chronic relapsing form, and it has therefore seemed best to assign them to a special class. The special feature of the form under consideration is the fact that the attacks occur at either short or long intervals, suggesting some predisposing cause, which continues active after recovery from the first attack. It differs from the relapsing form of the disease in that entire recovery takes place. The patient remains free from any trace of the affection for varying periods,

when suddenly and without warning he is subjected to another attack. The differences between the relapsing and the recurrent forms of the disease are analogous to the differences existing between an attack of typhoid fever in which a relapse and a second exacerbation supervenes during the convalescence, and an attack of malarial fever in which complete recovery takes place, but in which some predisposing condition residing in the patient conjoined with some exciting cause incident to his surroundings, leads to a recurrence of the disease.

The length of time over which these recurrent attacks may extend is surprising, as well as the remarkably large number which may occur within a short time, and yet recovery take place.

The following are presented as illustrative of this class of cases:

CASE LXXIX.[1]—J. N., aged forty-five, was seen by me in consultation with Dr. Weygandt, of this city, during an acute attack of appendicitis. He declared that he had suffered during the past eight years from attacks of colicky pain, referred to the general abdominal region, occurring at intervals varying from one to three months, and that he must have had more than fifty such attacks. An operation performed January 12, 1893, revealed an appendix which was thickened, strictured, dilated beyond the stricture, ulcerated and perforated at the dilated portion, angulated at the proximal portion of the organ, and gangrenous between the angulated portion and the base. The appendix was removed.

The patient made a good recovery, and when last seen, nearly a year after the operation, he stated that he had remained in perfect health ever since that time.

CASE CIV.—Dr. H. W. C. came under my care with the following history: Two years before, while traveling in California, he was attacked during the night by appendicitis. He had eaten a hearty meal before retiring. After a week he convalesced. During the succeeding two years he suffered from thirteen separate and distinct attacks. These were sometimes preceded by diarrhœa, and sometimes by constipation. On October 27, 1891, the appendix was removed after the subsidence of an attack. It was found to be the seat of a chronic thickening, its cavity being obliterated, and its structure changed to a fibrous cord.

[1] These numbers refer to my case-book records.

Complications and Sequelæ of Appendicitis.

The most important complication of appendicitis is the occurrence of peritonitis in one of its forms. Inflammation of the serous investment of the appendix itself is not included in the present consideration, nor should the occurrence of this form of localized peritonitis, which leads to the formation of adhesions, be considered other than salutary. Diffused inflammatory affections of the peritoneum resulting from infection, or septic peritonitis, which may or may not result in a suppurative process, are, however, among the most frequent, as well as the most fatal, complications.

Iliac Phlebitis.—This may occur as a complication of appendicitis. The condition will prove a very obstinate one to deal with. It is due to an infection, either from appendicular abscess, or a suppurative parietal appendicitis. In these cases the appendix lies in the direction W. or S. W. (Fig. 7). Phlebitis of both sides may occur simultaneously, due to an infection of both veins by a long appendix stretching across on the W. line; or the vein on the left side may become involved subsequently to that of the right.

Phlebitis with thrombosis of the iliac vein will give rise to œdema of the corresponding lower extremity. If septic changes occur in the thrombus, and portions of the clot become loosened and displaced, pulmonary thrombosis and septic pneumonia may be among the sequelæ of appendicitis.

Where the complication of iliac phlebitis and thrombosis occurs the convalescence will be considerable prolonged. These cases are usually tedious, and are not amenable to any specific treatment.

Fatal Hæmorrhage.—This may follow invasion of the iliac veins by the gangrenous process. The artery is much less liable to this accident. The following instance of the invasion of the right iliac vein came under my observation:

Case XLIV.—H. W., male, aged fifty-seven. Patient was seen by me January 22, 1891, in consultation with his family physician, Dr. Cruikshank. The usual symptoms of an acute appendicitis had ac-

companied the outset of the attack. Upon the fifth day he had apparently entered upon a safe convalescence, when grave symptoms suddenly supervened. An immediate laparotomy was performed. A gangrenous appendix was found in the S. E. position, imbedded in a mass of adhesions which were also in a gangrenous condition. The wound cavity was thoroughly cleansed and drained and the patient's condition improved. On the eighth day, while the wound was undergoing its usual daily redressing, a gush of blood followed the withdrawal of the gauze drains. This was temporarily controlled by the finger passed to the bottom of the wound cavity, and a tampon arranged as a graduated compress was firmly placed in the cavity and controlled the hæmorrhage. He never rallied, however, from the loss of blood, and died upon the following day.

Complications arising through the Medium of the Portal Circulation.—When the freedom with which the mesenteric veins feed the portal circulation is taken into account, the ease with which septic emboli from thrombo-phlebitis of these radicles may be carried to the liver, and there give rise to hepatic abscess, will be readily understood. As a matter of fact, however, mesenteric thrombo-phlebitis is only an occasional complication of appendicitis. Reginald Fritz calls attention to the possibility of its occurrence, and suggests that it may be due, either to a direct extension of the primary phlebitis, or from septic embolism.[1] Three cases of hepatic abscess of appendicular origin, in which pleuritis and pericarditis followed an eruption of the abscess cavity through the diaphragm, are reported by Gendron.[2]

This, as well as other late complications and sequelæ of the disease, will become less and less frequent as the dangerous character of the disease becomes more generally recognized, and early operative procedures are instituted for its relief.

Hepatic Abscess—As a result of pylephlebitis, hepatic abscess, either single or multiple, may occur. This is a most serious complication, and may so mask the other symptoms as to completely mislead the attendant as to the true nature of the case. The thromboses within the mesenteric veins become dis-

[1] American Jour. Med. Sciences, October, 1886, page 330.

[2] Étude sur le pylephlebite suppurative, Thésis de Paris, 1885.

placed, either in their entirety, or by portions becoming loosened and are swept by the current of blood into the portal vein, through which channel they reach the liver in the shape of sepsis-bearing emboli. The mechanism is the same as in hepatic abscess following dysenteric affections and certain operative procedures upon the hæmorrhoidal veins.

The symptoms of hepatic abscess following appendicitis are such as accompany suppurative foci within the liver substance due to other causes. Digestive disturbances, irregular chills, pain referred to the right hypochondriac region, erratic variations of temperature, tenderness just beneath the lower border of the ribs upon the right side, more rarely an icteric hue of the conjunctiva and skin, finally the occurrence of a tumor—these are the symptoms which change almost entirely the aspect of the case, and render the symptomatology puzzling to the medical attendant, unless he is mindful of the occurrence of this complication.

Purulent Pleuritis or Purulent Pericarditis.—These may result from the hepatic abscess. A large collection of pus, situated superiorly or posteriorly within the liver, will tend to find its way through the diaphragm. The latter will first be pushed upward, and give rise to difficulty of breathing. Later on the diaphragm itself will become inflamed, giving rise to considerable pain, and finally, ulceration and perforation will permit the pus to find its way into the pleural cavity, or into the cavity of the pericardium. If it be not removed from this situation by operation, and the patient survive sufficiently long, the purulent collection may ultimately be discharged externally either by means of a spontaneous opening between the ribs, or through the bronchi. Especial attention has been called to suppurative pleuritis as being a relatively frequent complication of appendicitis by Terrillon.[1]

Pelvic Phlegmon.—An exceptionally long appendix, placed in the S. E. position, may lead to an infection of the tissues

[1] Discussion upon Quenu's paper, "Operative Treatment of Recurrent Appendicitis in the Intervals of the Attack." Bull. et Mem. de la Soc. de Chirurgie de Paris, Vol. XVIII, p. 397.

within the pelvis, the results of which may not be apparent until a considerable time has elapsed after the beginning of the disease, or after the operative procedure instituted for the removal of the diseased appendix. The following case is of exceptional interest in this connection.

CASE CVIII.—M. E. S., female, aged twenty-one, was admitted to the Methodist Episcopal Hospital, May 14, 1893, suffering from a rapidly developing attack of appendicitis. No previous attack had occurred. The abdomen was opened by the usual right-sided vertical incision, and the appendix, which was ulcerated and perforated, was removed. Its position was southeast, or directly downward and inward, across the vessels, and its length was five inches. The colon was placed abnormally low, and the appendix reached well down and into the pelvis and seemed to lie between the rectum and the uterus. The appendix was removed. The depths of the infected area were cleansed as thoroughly as possible, and a drain of iodoform gauze placed in position. The external abdominal wound was only partially closed. The patient was discharged from the hospital after a six weeks' convalescence with the wound entirely healed.

On October 2, 1893, nearly five months after the operation, she was again admitted to the hospital, with a history of having suffered from what was thought to be malarial fever. An examination disclosed a fluctuating tumor, situated between the uterus and the rectum, which filled the entire cul-de-sac of Douglas. A second laparotomy was performed. The tumor was found to be a large abscess, located behind the uterus. The rectum was nearly perforated by the abscess. Both tubes and ovaries were normal.

Lumbar Phlegmon.—This may have its origin in infectious processes, invading the post-peritoneal connective tissue. An antecedent history of appendicitis may usually be made out, culminating in the discharge of pus into the structure of the lumbar region. In two cases of this kind, occurring in my hospital service, one died from purulent infection of the lumbar and dorsal regions, and prolonged septic conditions. The autopsy revealed a small post-cæcal abscess cavity, in the wall of which the thickened and infiltrated appendix lay. In the other case, upon incising the abscess wall, a large amount of pus, which had been

walled in, escaped. Upon introducing the finger a communication was found to exist between this one and a similar smaller cavity lying behind the cæcum.

There is a growing belief among surgeons that the dorso-lumbar abscesses of former times which could not be ascribed to a lesion of the osseous spinal column, and which were sometimes called peri-nephritic abscesses for want of a better notion regarding their origin, were really cases of suppurative inflammation of the retro-peritoneal connective tissue, having their origin in an appendicular abscess, in instances in which the appendix lay entirely or in part behind the peritoneum. Even a history of an acute attack of appendicitis may be absent in these cases, and yet the infection have its origin in the appendix.

Parietal Phlegmon.—Abscess of the anterior abdominal wall is comparatively rare. A case of this kind came under my notice at St. Mary's Hospital. The history dated back several weeks, and involved the usual and typical symptoms of appendicitis. Two other cases were seen in consultation. The patients were both children. The primary attack in the one case occurred two months, and in the other case three months previously. The abscess in both cases pointed at the umbilicus.

The Occurrence of Appendicitis in a Hernial Sac.—This should be noted as among the complications occasionally met with. At a meeting of the Brooklyn Surgical Society,[1] Dr. Rand presented a case in which an old and irreducible femoral hernia became the seat of a phlegmonous inflammation. The usual symptoms of appendicitis preceded the local appearances. An incision revealed the existence of an inflamed appendix, with an encysted seropurulent collection.

Fæcal or Urinary Communication.—These conditions resulting from a spontaneous evacuation of a purulent or sero-purulent collection into the rectum or bladder, giving rise to renewed infection from these sources, have already been referred to as a complication.

Appendicitis Complicating Pregnancy.—This complication is

[1] March 16, 1893.

of occasional occurrence. Four instances have come under my observation in a series of 143 cases. All four developed septic peritonitis before coming under observation. In two abortion took place prior to operation, while in the others the uterus emptied itself after the operation. All four died, the abortions not necessarily hastening, but rather heralding the fatal issue.

Talamon[1] mentions a case observed by Oppenheimer, in which the patient, at the seventh month of pregnancy, was attacked with the usual symptoms of appendicitis. Premature delivery took place on the third day, resulting in death. At the autopsy a post-cæcal para-appendicitis, and a perforated appendix were found, with pus burrowing along the kidney, and into the post-peritoneal connective tissue. Metastatic abscesses in both liver and spleen were likewise observed.

Appendicitis Complicating the Puerperal State.—One case of this kind was sent to my hospital service by Dr. F. E. Wilson, of this city. The case recovered after laparotomy. In all probability there was no especial relation existing between either the parturient act or the puerperal state and the etiology of the disease, inasmuch as the attack occurred ten days after the delivery. Attention is called to the case from the fact that when appendicitis occurs in the pregnant condition, as far as my experience goes, it is invariably followed by abortion with a fatal result; but in the post-parturient condition at term it does not seem to be such a mortal affection.

[1] Op. cit.

[TO BE CONTINUED.]

INTRACRANIAL NEURECTOMY AND REMOVAL OF THE GASSERIAN GANGLION.

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WITHIN the past few years intracranial excision of portions of the fifth nerve, together with removal, more or less complete, of the Gasserian ganglion, has been done for the cure of intractable trigeminal neuralgia.

The credit of first doing such an operation rests with Rose, of London, after whom is to be mentioned Novaro, Horsley, Andrews, Krause and others. Hartley, in the *New York Medical Journal* of March 1, 1892, published his method, and related a case successfully operated on. He has published a more full account of the same, with diagrams and cases, in the ANNALS OF SURGERY for May, 1893. It is as follows:

An omega-shaped incision was made, having its base at the zygoma and measuring a distance marked by a line drawn from the external angular process of the frontal bone to the tragus of the ear.

The curved and rounded portion of this incision reached as high as the supratemporal ridge, the diameter of said circle being three inches. The skin and deeper tissues were cut in the shape of the Greek capital letter omega. This incision was carried down to the periosteum of the skull in all portions of the incision, except in the straight part of the base; the tissues were then retracted and the periosteum divided upon the bone in the same direction as far as the straight part at the base. (Fig. 1).

With a chisel a groove was cut in the bone corresponding to the divided periosteum. This groove went to the vitreous plate, except at the upper angle over the rounded portion, where it included the vitreous plate.

A periosteum elevator was here inserted and used as a lever to

snap the bone on a line between the ends of the circular portion of the incision. In this way the breakage occurs along the lower portion of the wound, and a flap, consisting of skin, muscle, periosteum and bone, is thrown down, exposing the dura mater over a circular area of three inches in diameter. The middle meningeal artery was tied, the dura mater separated from the bone, and the floor of the middle fossa of the skull was exposed. Broad retractors were used to raise the dura mater with the brain, and to expose the foramen rotundum and the foramen ovale. The hæmorrhage was stopped by sponge pressure. The exposure of the first, second and third divi-

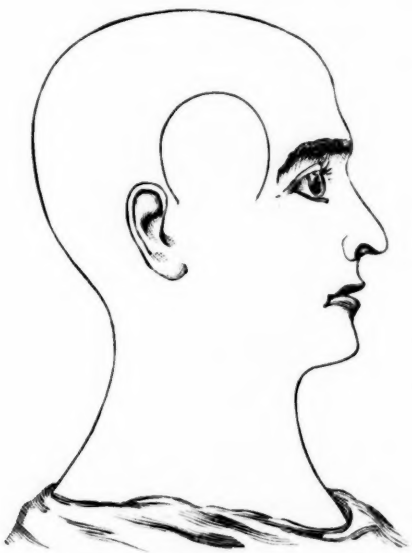

FIG. 1.—Showing Hartley's omega incision.

sions of the fifth nerve, together with the carotid artery and cavernous sinus was exceedingly good.

The second and third divisions were isolated at the foramen rotundum and the foramen ovale, and by slight pressure upon the dura mater, it could be stripped from the nerves to beyond the Gasserian ganglion. These were divided with a tenotome at the foramen rotundum and the foramen ovale, and that part between these and a point beyond the Gasserian ganglion was excised. As this amount of nerve is not very great, the ends of the nerves were pushed through the two foramina so as, if possible, to interfere with any reunion. In the

retraction of the dura mater, owing to imperfect instruments, the third, fourth and sixth nerves were somewhat injured. As no bleeding was present, the brain was allowed to fill the fossa. The flap—consisting of bone, periosteum, muscle and skin—was replaced. The irregular edge of the vitreous plate which remained attached to the bone not involved in the flap, acted as a shelf on which the flap rested, and prevented its falling in upon the dura mater. The periosteum was stitched, the muscle sutured in place, and the skin sewn with silk. One drainage tube was inserted at the lower angle; an antiseptic dressing was applied. Time of operation, one hour and forty minutes; the patient was carried to the ward in good condition. The disadvantage was the inability to resect as long a piece as could be done in some of the other methods.

It has been my fortune to operate four times for excision of intracranial portions of the fifth nerve. In each case the reason for the operation was trigeminal neuralgia, not due to disease of the brain. Hartley's method was followed. An account of each instance is appended, together with an examination into the present condition of the three patients who can be reached. All cases recovered from the operation, and were relieved of neuralgia, it is to be hoped, permanently.

CASE I.—Mrs. ——, aged fifty-nine, came under my care in September, 1892, suffering with right facial neuralgia, and gave the following history:

Pain began fourteen years ago in the right upper jaw nerve. The intermissions were complete and of varied length, months sometimes intervening between paroxysms. On June 10, 1890, the second division of the fifth was divided at the infra-orbital foramen. The scar of this operation is visible. For two years complete relief was obtained. Then the paroxysms returned with great vigor. For several months the patient had been unable to talk without bringing on severe paroxysms, had been unable to swallow, laugh, or to use the face muscles in any way; so much so was this the case that she carried a tablet on which to write, instead of speaking; she avoided solid food, and took only liquids. Her condition was one of very great suffering almost all the time; even when as quiet as possible agonizing attacks of pain came on.

The second and third divisions of the fifth were affected, cheek,

lips, tongue, gums, palate, and especially the auriculo-temporal region.

September 8, 1892, the operation was done in the usual way. The middle meningeal artery was torn in separating the flap of bone, and was ligated by passing a thread on a curved needle through the dura. On turning down the flap of bone, the opening in the skull was found to be not large enough and gave insufficient room, so more bone was bitten away with forceps. There was an escape of cerebro-spinal fluid from the aperture made in the dura at the time of wounding the artery. The second and third divisions of the nerve, together with the Gasserian ganglion, were well exposed to view. The nerves, and so much of the ganglion as seemed to be attached to the nerves, were removed, and the distal ends of the nerves tucked into their respective foramina. The bone was not replaced when the flap was put in position. A piece of silver wire, bent on itself, was laid at the posterior angle of the skin wound, so as to permit drainage if required. A voluminous dry dressing was then applied. The flow of cerebro-spinal fluid was so great during the first twenty-four hours as to necessitate on two occasions that a folded sheet under the head should be changed; in twenty-four hours the cotton and gauze dressing was replaced by a dry one. This was again necessary on the second and on the third day, although the flow of fluid was less, when the wire was removed. Stitches were removed on the seventh day. Pain ceased from the moment of operation, and the patient had an uninterrupted recovery. No disturbance to the eye in any way was noted, and the patient was soon able to return to her usual life. The patient has no teeth, they having been extracted several years ago, in hope of relieving the pain.

An examination of this patient thirteen and a half months after the operation shows as follows:

Motion of tongue unimpaired; the muscles of mastication are paralyzed. This did not appear to be so immediately after the operation. There are no trophic changes in the skin to which the divided portions of the nerve are distributed; it is not shiny or red. Sensation on the face is wanting in the area shown on the accompanying figure by the shading. (Fig. 2).

Outside the area of complete loss of sensation there is uncertain sensation.

The front part of the tongue and the antero-lateral (right) aspect is without sensation, but a touch is recognized just in front of

the circumvallate papillæ. The hard palate is without sensation. The soft palate is indistinctly sensitive. The mucous lining of the cheek in its anterior part is without sensation; further back sensation is present. Heat and cold are recognized in portions of the tongue where ordinary sensation is wanting. Taste on the tongue is not interfered with.

The method of investigating taste was as follows: The tongue was drawn beyond the lips, and securely held. Its surface was then dried with a soft rag, and a drop of warm water, containing sugar or salt in solution, was put on the part of the tongue entirely without

FIG. 2.—Showing areas of anæsthesia resulting in Case I.

sensation, either of general touch, of heat or cold. Almost instantly the patient was able to tell whether sugar or salt was put on her tongue, and this, of course, without drawing the tongue into the mouth, but while the tongue was firmly held outside the lips.

The patient states that the tongue is now more sensitive than it was at first; she complains of a feeling as though the gum and cheek of the affected side were covered with India rubber. She chews on the left side, for occasionally food which is being eaten gets into the right cheek, and it is necessary to press it back into the mouth with the hand. This, however, occurs but seldom.

The right occipito-frontalis is not paralyzed, nor is the corrugator supercilii. The patient wears without discomfort the same set of false teeth that she wore before the operation. Slight pulsation under the flap. Temple concave.

CASE II.—B., aged sixty-seven, male, has been operated on for neuralgia of the second division of the fifth, right side, several times. The nerve has been cut away at the infra-orbital foramen; then more deeply, and finally Carnochan's operation was done. Temporary relief was afforded after each operation, but the pain subsequently returned.

In February, 1893, I divided the middle division of the fifth, intracranial, but did not divide the third division, as the patient had not suffered from neuralgia of this branch. Recovery was uneventful, and he went out of the hospital in three weeks.

I have not been able to see him since he left hospital, and therefore his present condition is unknown to me.

(The artery was torn as in the first case, and required to be tied.)

CASE III.—Miss ——, in her seventy-ninth year, gives the following history: Pain in the second division of the fifth nerve, on the right side, began in 1863. The pain was not great and occurred rarely at intervals during several years. The intermissions became shorter and the pain more marked. In the third division pain was noticed several years later. The pain became progressively worse and worse. At the present time the pain in the lips and gums and tongue is most intense.

The patient sits with the mouth open lest the lips should touch each other; holds the lips as still as possible; does not move the tongue; allows the saliva to dribble from the mouth because the pain in swallowing it is so great. This pain is not in the throat itself, but is referred to the tongue, lips and side of the cheek. She has had no teeth extracted on account of neuralgia; one of the very few cases about whom this can be said. Yawning is impossible on account of pain, which is referred to the lower jaw joint. She has taken no solid food for some years, and has lived on soft toast, soft eggs, tea, etc. There is on right side hyperæsthesia of the face, and the skin is rough and coarse, The condition of the patient was most distressing. She had been subjected to no operation, and had borne her sufferings as best she could.

I operated in the usual way, June 30, 1893, notwithstanding the

patient's advanced age. She seemed active and strong, and I did not think her number of years should prevent my affording relief, if I was able so to do.

The middle meningeal artery was not divided. When the second division of the nerve was exposed at the base of the skull, I stripped the dura from it as usual. There was a gush of cerebro-spinal fluid, which subsequently welled up quite clear until, perhaps, two ounces were sponged away. The second and third divisions of the nerve and the Gasserian ganglion were then exposed, excised, and the nerve ends pushed back into their respective foramina.

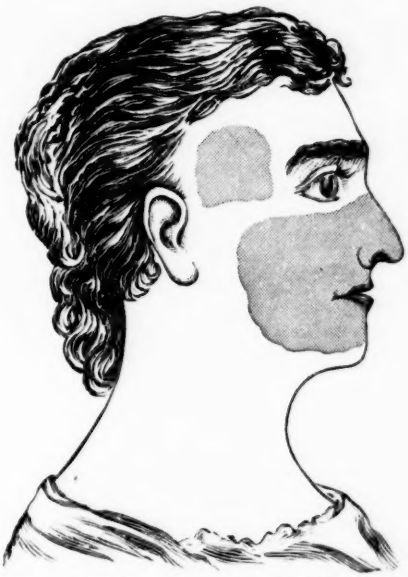

FIG. 3.—Showing areas of anæsthesia in Case III.

The wound was closed as usual, and a dry dressing applied, which was changed on the eighth day. Recovery was uneventful; relief from pain absolute.

Examination four months after the operation reveals anæsthesia of the face, as shown in the diagram by the shading. (Fig. 3).

Outside the area of complete anæsthesia there exists a zone of irregular sensation, in which the difference between heat and cold is plainly recognized, but ordinary sensation is wanting. The tongue, in its right lateral half, as far back as it can be touched, is anæsthetic. So also the inside of the cheek, and the hard and soft palates.

Taste.—Sugar and salt are plainly recognized on the anterior portion of the tongue where anæsthesia exists.

The muscles of mastication are paralyzed. The right anterior half of the occipito-frontalis is paralyzed; also the right corrugator supercilii, doubtless from division of the branch from the seventh by the superficial wound. Electricity shows degenerative reaction.

There is no pulsation to be recognized under the flap. Temple concave. A slight touch on the teeth in either the lower or upper jaw of this patient is felt distinctly. The harsh, rough skin has become smooth and fair, and the face has become that of a placid and contented woman.

Dr. F. T. Miles examined this case with me.

CASE IV.—Mrs. S., aged forty-six, a widow, came under my care in 1882, suffering from neuralgia of the third division of the fifth.

In the body of the lower jaw I chiselled the bone and excised one inch of the nerve. The wound healed at once and complete relief was obtained, which lasted thirteen months.

She then consulted me again, suffering pain in the lower lip, tongue, in the auriculo-temporal region, and in the territory supplied by the second division of the fifth.

Prior to the first operation she had been subject to neuralgia for six or seven years, diffused over the side of the face, which was localized only within a few months of the time when she first consulted me. Paroxysms now came on very frequently, and they were excited by movement, by touching the face, or without apparent exciting cause. The skin over the affected area became bright red during a paroxysm of pain.

September 25, 1893, I performed the usual operation. The meningeal artery was not interfered with. As the brain seemed somewhat in my way, I raised the dura and opened it, thus permitting cerebro-spinal fluid to escape, which gave me much more room. So the exposure and removal of the nerves and ganglion became easy. A bit of bent wire was laid at the posterior angle of the wound, and removed with the first dressing. Some blood, but no cerebro-spinal fluid, escaped into the dressing.

On the sixth day after the operation the patient put her hand by the side of her eye and scratched the wound under the dressing which she said itched very much. This irritated the wound somewhat, and on removing the dressing two days thereafter I found

some redness at the point where she had scratched it. The dressings were changed and stitches removed, and everything went well.

Present condition: Pain entirely relieved. Anæsthesia of the face is shown in the diagram by the shading. (Fig. 4).

The right half of the tongue, hard and soft palates, gums, and inside of left cheek are anæsthetic, but not extending so far back as in the previous cases.

The replaced bone is firm and strongly in position. The right half of the occipito-frontalis is paralyzed, as also the corrugator supercilii. The anterior extremity of the omega incision is hyperæsthetic. There are no trophic changes in the anæsthetic area. The

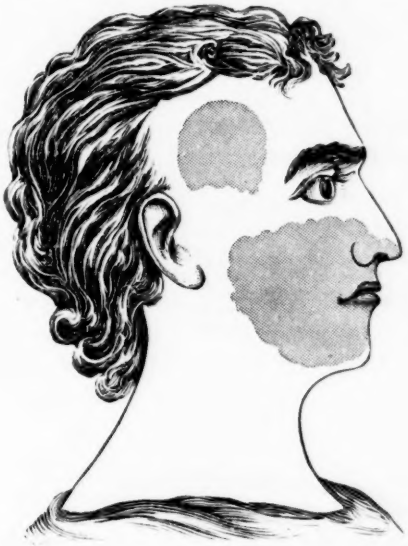

FIG. 4.—Showing areas of anæsthesia in Case IV.

muscles of mastication are paralyzed. The difference between heat and cold is not recognized in the anæsthetic territory. Taste within the mouth, the patient says, is the same as always, but the difference between salt and sugar is not recognized when applied on the tongue held beyond the lips. The conjunction of the right eye is slightly anæsthetic. The right nostril is not so sensitive as the left to the smell of ammonia.

While the method pursued in all of my cases was not entirely that indicated by Hartley, it varied from it so little as properly to be classed as instances of his operation.

The skin incision has been as his; the division of the skull I have made with chisel, also using strong forceps. I have not found that the bone always broke as low down as I would wish it, and so have not hesitated to remove additional bone with forceps. Whether the bone is replaced or not does not affect the healing of the wound.

In two of the four cases the middle meningeal artery was divided while making the bone flap, and was tied by passing a single silk ligature through the dura proximal to the tear by means of a curved needle.

I have noted that when first opening the head the brain seemed to fill the cavity and the dura appeared tense; this is due to the presence of cerebro-spinal fluid, as well demonstrated in the two last cases.

In the last case I did not, therefore, hesitate to puncture the dura and evacuate the fluid, after which, the patient being on the opposite side, the brain was found to lie quite away from the field of operation, and the dura mater rested wrinkled on the surface of the brain, as a sheet loosely thrown over a bed. Thus ample room was afforded for uncovering the nerves and exposing the ganglion. This observation was to me extremely interesting.

In uncovering the nerves I begin with the second division. Having uncovered it, I pass a ligature around it with a long aneurism needle having a short curve; then strip the dura from it backwards, reaching the third division and the ganglion.

With the same needle I pass a ligature around the third division. Making gentle traction on the ligatures, with a long, sharp curette I am able to separate the nerves and take away the adjacent portion of the ganglion, and then make my section of the nerves at the round and oval holes. In this way I do not attempt to take away all the ganglion. I exposed and recognized the first division, but left it alone, for there was no reason why it should be disturbed.

In certain cases hitherto reported, trouble with the eye, ptosis, etc., has been reported. In none of my cases has any disturbance of nutrition or function of the eye been apparent. I attribute this to the method already referred to for isolating

the nerves and the ganglion, and confining the operation exclusively to them.

The operations have been long, but recovery in each instance has been rapid and complete. In all cases the wounds healed at once, except the fourth, where the patient scratched the recent wound and infected it.

It is worthy of note, very suggestive for the future, that in the case of the patient upon whom operation was performed fourteen months ago there is less anæsthesia and more perverted sensation than in the other cases. Sensation seems to have returned somewhat, and it is interesting to speculate as to whether sensation will ever completely return, and if so, by what route.

Preservation of the sense of taste, after division of the second and third divisions, is to be noted.

That the power to recognize heat and cold exists in a region rendered devoid of ordinary sensation by nerve section is of much interest, and recalls an observation made some time since that a conjunctiva insensitive from the local application of cocaine still appreciates the difference between heat and cold.

When dividing the third division of the nerve in Case 4, I believe that I isolated and recognized the motor branch before dividing it. Not having provided myself with a sufficiently long and fine electrode, I could not prove the accuracy of my opinion by electric stimulation, and therefore divided everything.

By leaving intact the motor branch the patient would not have food collect in the cheek of the paralyzed side, and in future operations an effort should be made towards this end.

SARCOMA OF THE KIDNEY; ITS OPERATIVE TREATMENT.[1]

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IN this brief paper I shall not rehearse the ætiology, symptoms, diagnosis and prognosis of sarcoma of the kidney, as these have been carefully canvassed by Newman, Morris, Butlin and others, and about which there is a very general agreement. It is with the question of operation, its advisability and its technique, that this society has most practical interest.

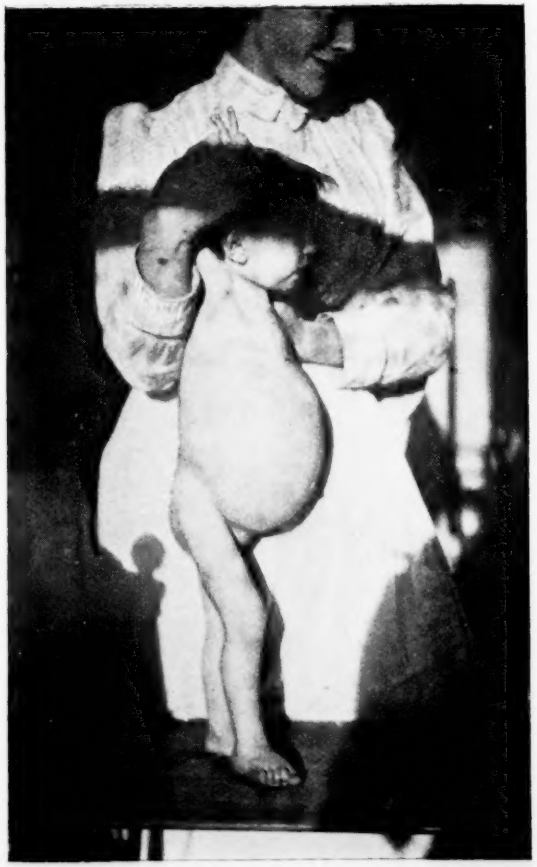
Three operative cases which I shall put on record have instructive features which are worthy of attention. I will narrate them here.

CASE I.—*Sarcoma of Kidney Weighing Two and One-fourth Pounds, Child Two Years Old. Nephrectomy; Recovery; Perfect Health One and One-half Years Afterward.*—Julia D., a child of two years, was admitted to the Babies' Hospital (Fifty-fifth St. and Lexington Ave.) March 25, 1892. The baby had no ascertainable history of hereditary disease and was in excellent health until five months before admission. Then the mother noticed a small lump in the abdomen which had progressively enlarged. There had been no disturbance of the child's habits or functions, except for one day, three months before admission, when she had loose stools and bloody urine. This recurred once, for a day only, two weeks later, but had not been repeated.

The child had been taken to three of our largest hospitals and operation was refused.

When admitted her general condition was good. There were

[1] Read before the New York Surgical Society, November 8, 1893.



CASE 1.—Sarcoma of the kidney. Weight, 2¼ pounds. Child, 2 years old. Perfect health 1 year and 8 months after operation.

no evidences of disease in heart or lungs. Nutrition was well carried on and the child was not puny or emaciated, though not robust. Its complexion was pale, but not cachetic.

Examination showed an abdomen largely distended by a solid growth occupying its greater portion, crowding upward and spreading the ribs, causing the lower abdomen to sag and filling the right loin. The greatest circumference of the body was twenty-one and one-half inches. Examination under chloroform showed the surface veins somewhat enlarged. The right inguinal, lumbar, and hypochondriac regions were filled by a solid growth which crossed the median line to the line of the left nipple.

The outlines of the tumor could be distinctly defined. The colon resonance was advanced to the median line.

The urine examined revealed a trace of albumin, but no casts. Specific gravity, 1015; acid; no sugar; no blood. Diagnosis, by Dr. L. Emmet Holt and myself, was of sarcoma of the kidney.

For two weeks before operation the patient took milk diet, but nourished poorly. Pulse was at times irregular and she seemed weak and languid. She passed urine freely and was regular in bowels. The possibility of a successful operation, added to the strong desire of the mother that it should be done, in view of the hopelessness of the present situation, led me to do the nephrectomy as follows:

Operation April 12, 1892. The child was enveloped up to its hips in cotton, bandaged on, exposing only its abdomen and side. She was etherized and placed in Trendelenburg's posture at an angle of forty-five degrees. I was assisted by Drs. Fisk and Dunham. A transverse incision was made, eight inches long, over the prominent portion of the tumor extending from the lumbar muscle nearly to the median line. No peritonitis was found. Large veins stood upon the surface of the tumor.

The growth shelled out of its bed and a good pedicle was formed, which was tied with a silk ligature. There was very little blood lost, scarcely half an ounce, owing to the position. The anterior wound was closed by sutures; the posterior part packed with iodoform gauze. The operation lasted forty-five minutes and was well borne.

Milk and lime water were given during the night and thirty drops of whisky every two hours. She slept six hours and voided urine voluntarily. The temperature rose to 102° during the next day. Morphine was used to quiet restlessness and the stimulant continued.

In forty-eight hours the packing was removed, and everything went well from that time on. The stitches of silkworm-gut were left in the abdominal wall two weeks and the wound speedily closed. The child's health improved rapidly and nothing prevented a perfect convalescence.

The tumor was of irregular oval shape and weighed two and one-fourth pounds.

The pathologist's report defined it as a round-celled sarcoma, but a recent examination by Prof. E. K. Dunham, of Bellevue, shows it to be a carcinoma sarcomatosum.

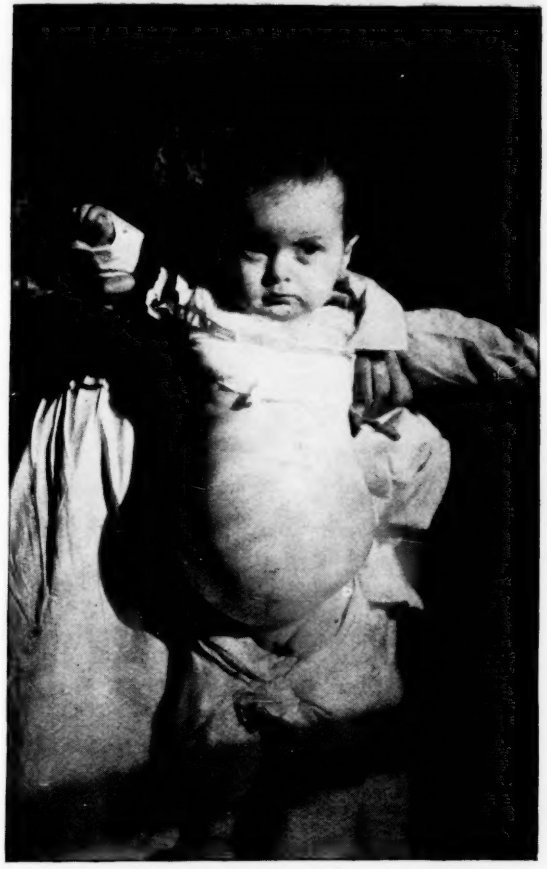
The tumor of kidney from Julia Dollard (April 12, 1892) is one of a good deal of interest. In the tumor there are places where there are imperfectly developed tubules similar to, though not identical with, the renal tubules. There are also irregular patches and rows of cells, which I take to be epithelial cells. In between these masses of epithelium there is a connective tissue so rich in cells of various arrangement that it might well be regarded as sarcomatous. It is as though we had before us an adeno-carcinoma in which the stroma was formed of spindle-celled sarcoma. Now, I find in Orth's "Compendium der Pathologischanatomischen Diagnostick," Hirschwald, 1884, p. 317, a statement that such mixed forms of combined carcinoma and sarcoma do occur in the kidney (which he says is a favorite site for them). Boyce, in his "Morbid Histology," Appleton, 1892, begs the question as to nomenclature by saying, "Tumors of the kidney [primary] especially the larger ones, appear very frequently in fœtal life or in early childhood. In addition to the remarkable cystic tumors . . . there are two very important classes, the adeno- and the myo-sarcomata. These tumors appear in one or both kidneys, and in a multiple form in either. The adeno-sarcomata, adeno-carcinomata, or congenital adenomata, as they are variously termed, consist either of solid epithelial acini (as in this specimen) or of tubes (as, imperfectly, in this specimen), papillomatous cystic formations and so-called pseudo-glomeruli, thus more closely resembling kidney tissue." [Page 278.]

It seems to me that the term "carcinoma sarcomatosum" (Orth), expresses the structures found in this tumor better than the terms employed by Boyce. In my sections the adeno-carcinomatous portions so predominated over the sarcomatous structures that I called the specimen simply adeno-carcinoma, thinking that the most important feature. I now qualify that diagnosis by mentioning the sarcomatous element in the specimen.

Yours very truly,

EDWARD K. DUNHAM.

The child, just a year and a half after operation, is in perfect health. A fine red complexion has replaced the sallow, almost cachetic one at the time of operation, and a careful examination fails to reveal any trace of neoplasm. The scar of the side is solid and surgically perfect.



CASE 2.—Sarcoma of the kidney. Weight, 7½ pounds. Nursing child aged 14 months, weighing 15 pounds after operation. Perfect health more than 1 year after.

The second case is one of unusual value, and is now presented for examination by the members of the society.

CASE II.—*Sarcoma of Kidney Weighing Seven and a Half Pounds, Child Weighing Fifteen Pounds, Aged One Year and Two Months. Nephrectomy; Recovery; Perfect Health One Year Later.* —Lucretta M., the child of healthy parents, with no hereditary history of tumors.

The child is still being nursed at the breast. Admitted to the Babies' Hospital November 20, 1892. Only six weeks before, the mother had noticed a slight enlargement of the abdomen, since which time the entire growth had taken place, with no symptoms, but a slight cough and a little loss of flesh during two weeks past. The bowel and kidney action has been normal. There had been no pain. The child maintained a good color, and had a normal temperature, though somewhat rapid pulse, 150, and respiration 56.

Examination by Dr. Holt and myself showed a rather hard solid tumor filling the abdomen, apparently growing from the right kidney.

The child was prepared with great care for the operation, which was done with the able assistance of Drs. Fisk and Dunham, in the presence of Drs. Holt, Kinnicutt, Draper, Frank Markoe and Northrup.

Operation November 20, 1892. The little patient was etherized and placed in Trendelenburg's position.

A small exploratory incision was made in the median line of the abdomen above the navel, and on introducing the index-finger it was swept about and confirmed the opinion that the whole abdominal mass was one tumor free from adhesions.

A long transverse cut was then made from the median incision around the right half of the abdomen to within two inches of the spine. The structures of the wall had been thinned out so that stout scissors cut the combined layers at once, with scarcely any loss of blood.

The surface of the huge tumor was traversed by large veins. The threatening aspect of these, many of which seemed stellate, as if they entered or emerged from the tumor, and must be beyond control during enucleation, almost called for the abandonment of the procedure at this stage.

The child having been turned on her side, and being inclined at more than forty-five degrees, it was evident when enucleation was com-

menced at the least congested part, that light pressure would control the venous bleeding. The most bleeding occurred on the anterior surface on commencing its removal. One ounce was lost before it could be controlled. After that step the growth was separated from its cellular surroundings by finger-dissection, and sponge pressure stopped all oozing at once. A narrow pedicle was at last made, which was found to be double, one-half holding the vascular supply of the tumor with its cellular bed, and the other, when separated, holding the renal vessels and pelvis of the kidney. This was connected with a very pale kidney elongated to about five inches and throughout its entire length apparently normal in structure, except that at its upper end, it merged with the tumor, with which it had been completely removed from its bed in the loin.

Before ligating the double pedicle, critical examination showed that it was possible to amputate the kidney above its pelvis, leaving an inch and a half of apparently sound structure attached to the tumor.

This was, therefore, done, and a continuous suture of the kidney stump applied. The greater pedicle of the tumor alone was then ligated with silk and the kidney replaced in the loin.

Throughout the operation the patient lost not more than two ounces of blood, and, though under ether in all about an hour and a half suffered little shock. The abdominal wound was sutured with interrupted silk and silkworm-gut sutures, except posteriorly where a tamponade of iodoform gauze was applied.

The greatest care was given to sustaining the child's heart action by maintaining the inclined position not only throughout operation, but continuously for the succeeding day or two, the body being kept at an angle of thirty degrees. The added security, due to keeping the limbs swathed in cotton, to the liberal use of hot water bottles, to occasional hypodermics of brandy and strychnine, and, by no means the least, to enemas of hot black coffee—two ounces—at the end of operation brought the child through.

The child rallied beautifully; suffered no pain, and had normal functional action of kidneys and bowels during the entire convalescence.

The kidney wound healed without a drop of urine appearing at the drainage point. A few sutures were left in the abdominal wall for a fortnight. The day after operation the temperature rose to 105°, but quickly dropped to normal.

Convalescence was uninterrupted, and the child returned to its home in five weeks. Its nutrition subsequent to operation was its mother's milk.

Examination of the tumor showed it to be a dark massive lobulated growth, with the portion of kidney attached, its end spread out upon the tumor. The capsule was a continuous one upon the surface of each, and on section no capsule defined the growth from the kidney.

The limitation of tumor and kidney was fairly well shown on section; though they merged somewhat into each other, there was no apparent infiltration. Where the kidney section was made its structure was normal and far removed from any suspicious tissue.

The tumor weighed seven and a half pounds. The child, after operation, weighed fifteen pounds.

Microscopical examination made by the pathologist of the hospital, Dr. Waldstein,[1] and by Professor E. K. Dunham defined the tumor as a rhabdo-myo-sarcoma, containing a large portion of striated muscular tissue, mingled with round and spindle-celled sarcoma.

It would seem probable that the tumor grew in the capsule of the kidney, and, dragging the kidney from its bed, caused an extraordinary elongation, as it measured five inches long by one and a half in breadth.

CASE III.—*Sarcoma of the Right Kidney; Patient Aged Sixty-five; Nephrectomy; Death.*—The patient, Thomas L., an inmate of St. Luke's Hospital, presented an excellent illustration of a rapid-growing sarcoma of the right kidney.

The man was in active life up to five months ago when he began to lose flesh, and strength, and to have abdominal pain with frequency of micturition. Two months ago he began to pass blood in the urine and soon took to bed. These symptoms with the presence of an enlarging tumor in the side, continued up to the present.

Differential diagnosis from pyelonephritis, calculus hydronephrosis, etc., was easily made by the nature and feeling of the somewhat irregular ovoid tumor filling the right flank.

It was evident that if no attempt was made to remove the tumor, the patient would never leave his bed.

The condition was fairly presented to the patient and he solicited operation.

[1] Reported in the Path. Soc. Rec., N. Y. M. R., January 15, 1892.

The liver was pushed forward by the tumor so that its free edge could be felt two-and-a-half inches below the ribs. No trace of glandular or other disseminated infection could be found.

The patient seemed in fair condition to bear operation if hæmorrhage was not too great.

The tumor extended from the ribs to the brim of the pelvis, could be well grasped by the hands, and had pushed the colon to the median line.

The tumor was somewhat tender to pressure.

The superficial abdominal walls were distended, as well as those of the lower extremities.

The urine was acid, specific gravity 1018, and had 2 per cent. of albumin with granular and hyaline casts, and a few red blood cells.

After a fortnight of treatment the albumin and casts disappeared from the urine and his strength improved.

Operation.—June 16, 1893.—The patient was placed in the usual semi-prone position for nephrectomy, and a transverse abdominal incision, ten inches long, made from near the spine parallel to and an inch below the twelfth rib. This gave excellent access to the tumor which was separated from its bed by finger dissection.

The bleeding was venous, almost entirely and readily controlled by sponges and clamps until the detachment of the tumor from the median line was reached when the entire mass tore through, close to the vessels and profuse hæmorrhage would have occurred had not quick sponge pressure been made, replaced by broad clamps which were left *in situ*.

The peritoneum was necessarily torn through, and the rent was sutured with catgut. The wound was sutured anteriorly and tamponed posteriorly, as usual.

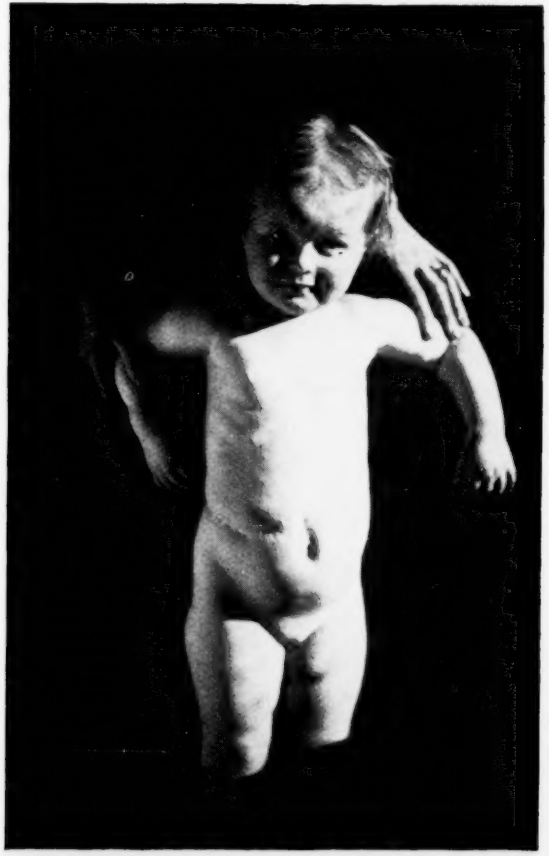
The patient was rallied with hot coffee and brandy enema, and later large fluid enemas with brandy given. The pulse became full and strong, and he seemed to do quite well until twelve hours after operation when his powers flagged, and in spite of strychnine, digitalis and other stimulants he sank and died fourteen hours after operation.

Post-mortem Examination.—No sarcomatous infiltration infarctions or gland enlargements were found anywhere.

The opposite kidney and adrenal were normal.

In the walls of the operated cavity were some small remnants of neoplasm where the tumor tore away.

CASE 1.—Perfect health more than 1 year and 6 months after operation.



CASE 2.—Perfect health more than 1 year after operation.

The vena cava, in the upper abdominal region, was distended with adherent clot, soft on the inside.

The lower part of the vena cava and both common iliacs contained old adherent organized thrombi, tunnelled along their sides.

This thrombosed condition was evidently caused by pressure and irritation of the growth and accounts for distention of the veins of the legs.

The pathologist's report (Dr. Thacher), upon the examination of the tumor, which weighed over three pounds, was, that it was of irregular surface, soft consistence, and in places was broken down.

Its color on section was reddish yellow and in parts nearly white. Microscopically it had typical sarcoma structure, the cells being of medium size, mostly round.

In these cases it does not appear that there was any hereditary disposition to tumors, and I think, generally, absurd stress is laid upon this consideration in making differential diagnosis. These tumors of the kidney present physical signs which more than in any other variety of growth explain themselves. The form, position, and manner of growth, their afebrile course, their firm feeling, mark them with distinct character. There is, it is true, in some of the rapid-growing sarcomas a deceptive sense of fluctuation, but to offset this a lateral enlargement or lobulated form give it an unmistakable stamp.

The differential diagnosis as to the variety of solid tumor, sarcoma or carcinoma is not possible, nor does it matter. A solid tumor is for all practical purposes malignant.

After its discovery these solid masses take on, in almost all cases, most rapid growth, and in a very few months, sometimes in weeks, attain great proportions. I know of no tumor anywhere in the body capable of so rapid growth. In children under ten they have, occasionally, been seen weighing thirty and in adults over forty pounds, and this growing within a few months. The largest tumor of the three recorded here, the tumor of seven-and-a-half pounds, was only six weeks in growing. Of the others, weighing about three pounds, one was eight weeks the other six months.

As to anatomical relation of the diseased growth to the

sound kidney, we are interested in view of the possibility of separating the two, as was done in one of my operations. Each case varies from others within such wide limits that one may find at one time a general infiltration of the kidney structure by sarcoma scattered so as to include small bits of renal tissue preserving their function, but not separable from tumor, with the mass built up in the shape of a kidney, grossly exaggerated. Or again the kidney may be whole and sound, but nestling in a depression of a large neoplasm, or entirely enveloped by new growth which, having started in the capsule, has spread in the cellular lymphatic spaces.

On the other extreme, the tumor may grow from a portion of one end of the kidney, as illustrated to-night, giving the surgeon an opportunity to preserve the greater part of the organ to the patient.

No similar case to this has before been reported, and it will at once be asked "Is it sound surgery to thus risk leaving a contaminated gland?"

This question was answered at the time of operation by a careful examination of the parts, which showed that no portion of the kidney except that immediately on the tumor partook in the slightest degree of the nature of the disease. The efferent veins from the tumor mass formed a group somewhat apart from the hilum of the kidney, and the lymphatics probably grouped themselves with these. The question whether the arterial supply of the tumor reached it through the kidney was of less importance than whether the return circulation was by that route.

Being satisfied by inspection that the tumor veins did not empty through the renal pedicle, I severed the kidney at a reasonable distance from the tumor (one and one-half inches) cutting through sound tissue (as proved afterward by microscopical examination), and felt safe that the track of usual systemic contamination had not been left.

No lymphatic glands could be felt anywhere in the mesentery, and it is quite possible that, large as the tumor was, its well-marked capsular envelope confined the essential cells of its growth, so that lymphatic infection had not as yet occurred.

Windle, Newman and others would have us accept the modern pathological view that these primary sarcomas must have existed in the renal substance from birth, even though they develop only in the latter part of life, as in my third case—being the result of inversion of embryonic cells originally. When their enveloping capsule once gives way the cells grow with enormous rapidity.

The question of the curability of sarcoma stands side by side with that of cancer, and as yet statistics show that only a few cases have gone beyond the three-year limit of time. One has lived five years. Barth, of Marburg, reports up to June 8, 1892, collected statistics of 100 nephrectomies for malignant disease, the largest yet gathered, of which forty-two died from operation, twenty died from metastases and thirty-eight were cured. The use of the word cured here cannot be accepted in its strictest sense.

Sigrist collected sixty-four, with thirty-two deaths from operation. Nine went a year and a half and had recurrence. Five went beyond two years and one continued well at four years.

The question of advisability of operation is not always the same as one of curability of the disease, either to the patient in whose breast the exhilarating sentiment of hope will always be found or to the surgeon who may yet hope to perfect methods and results which will alter the discouraging statistics.

If this were not so why do any of us continue to remove mammary cancers? Is not the improvement in operative work and results in malignant disease of the breast a sufficient reason why we should endeavor to improve the technique of nephrectomy, and save at least many of the 50 per cent. mortality from operation alone?

Even if the cured cases can be spared to three years of happy and useful life, as illustrated by Dr. Keyes' case, who enjoyed good health and was in active business, or if the children can be snatched from the grave to have the roses come back to their cheeks for a year or two to gladden their parents, it still seems to me a justifiable operation.

Two or three points in the operation are, in my experience, worth great emphasis.

The question of abdominal or lumbar incision will, I believe, trouble few members of this society. The size and position of the growth will largely determine the matter, and it is useless to gather statistics to show that opening the peritoneum has any inherent danger from the method of wound treatment to-day.

No surgeon now contemplates with anxiety a rent or an incision in the peritoneum during an operation, unless there is a pus cavity at hand. The greater mortality from intraperitoneal nephrectomies is probably due to that method being resorted to in tumors too large to be easily removed by the loin and, in themselves, more grave. "The real fact is," says Mr. Tait, "the kidney is best reached by the *most likely looking road*."

My own preference is for a straight incision from near the spine, parallel to the last rib, an inch below it, and continued as far as need be toward the median line, crossing the rectus abdominis if the tumor be large. Through such incision any renal tumor can be handled, and to be *safely* handled, ample room must be had.

The peritoneum will not be opened unless the tumor be large, and then it is better so.

The danger of a weak scar when the muscles and fascia are cut across is no greater, if they are properly united, than in cutting outside the rectus in Langenbuch's incision.

If asked my preference, I would say, "Always a cross cut."

Of much greater importance than the cut is the question of saving hæmorrhage—and here I believe will be made the greatest advance in the operation.

In Trendelenburg's position I believe we will find as great an aid for renal as for pelvic surgery. The two children I operated on thus, and with astonishingly light hæmorrhage. In the adult I unwisely adopted the usual nephrectomy position, and the profuse venous hæmorrhage and resulting shock had much to do, I fear, with the fatal result.

More than this. The position gives natural drainage of the tumor itself before removal, and I have little doubt that half a

pound or more of blood was saved to the patient's system by thus elevating the seven and a half pound tumor.

A mortality of 50 per cent. from operations implies profound shock, and this, I believe, is largely due to hæmorrhage. To combat this advise a hot black coffee and brandy enema at the end of operation, a large warm saline enema and strychnine hypodermics; maintaining warmth and the inclined position will also be always large factors for recovery.

In cases where a pedicle is not easily made, clamps should be secured and no ligature applied. The clamps must remain at least two days, as in case of clamps used on broad ligaments in vaginal hysterectomy.

T. Jones reports two cases with recovery where clamps were left on two and five days. It was necessary in my third case to use them, and I found them quick and easy to apply without traction on the pedicle.

Both Butlin and Thornton take a pessimistic view of the value of operation for sarcoma in children, and think it will fall into disrepute.

On the other hand, though recognizing the fatality of the operation, Koenig is more optimistic, and believes that surgery should make such advances as it can and look hopefully ahead.

I myself take this view, and believe the records can be greatly improved.

URETERO-URETERAL ANASTOMOSIS—URETERO-URETEROSTOMY.

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A CONSTANT dread of the surgeon dealing with myomatous uteri and other large pelvic tumors is the possibility of bringing the ureter into the field of operation and either cutting or ligating it.

The liability to injury is much increased when the ureter is displaced to one side or lifted out of its normal position by the tumor.

My attention was first called to this subject about eight years ago in the case of a little girl, about three years old, in whom I found a large dilated ureter coursing over the top of a retroperitoneal sarcoma. The tumor had lifted the ureter entirely out of the pelvis displacing it upward into the lower abdomen. The most marked displacement that I have encountered in my work since that time occured in the patient whose history forms the basis of this communication.

The patient, a mulatto twenty-five years of age, was sent to me by Dr. Cheston, of West River, Maryland. Three weeks previous to her admission to the gynæcological ward of the Johns Hopkins Hospital she had given birth to a still-born child in the eighth month. Immediately after this labor a large tumor was found lying transversely in the false pelvis from one iliac fossa to the other, and filling the whole lower abdomen. From its peculiar form some doubt was entertained in a consultation, concerning the nature of the tumor, as it was thought that it might be an extra-uterine fœtus. As the patient did not gain strength after her confinement, and seemed to be failing rapidly she was referred to my ward in the Johns Hopkins Hospital.

On examining her I found a large nodular mass about the size, and somewhat the shape, of a large fœtus at term, which filled both the true and false pelvis, and extended up above the umbilicus. The small cervix, the vault of the vagina and the bladder were drawn up into the abdomen and displaced to the left.

Her temperature on admission was 37.7° C. (99.8° F.), ranging from 37.8° to 38.9° C. (100° to 102° F.) up to the time of operation. Her pulse was full and strong, varying from 74 to 120. Urinary examination: Color amber, flocculent precipitate, acid, specific gravity 1018, albumin but no casts.

From the density of the masses and their relation to the cervix, the diagnosis of myoma uteri was made.

Hysteromyomectomy was performed May 1, 1892. The large myomatous uterus was exposed immediately beneath the peritoneum and lifted out of the abdomen through an incision twenty-four centimetres long. Both tubes and cornua uteri were drawn high up into the abdomen by the tumor, the round ligaments lying like guy-ropes close to the sides of the enlarged uterus. The uterus exhibited three myomatous masses, one about twelve centimetres in diameter at either cornu, and the third and largest, eighteen centimetres in diameter, partly within the pelvis, below the mass at the right cornu (Fig. 1).

The round ligaments and both ovarian arteries and veins were ligated near the brim of the pelvis, after which the broad ligament on the right side was opened and its peritoneal layers pushed to the front and back of the pelvis, thus exposing the uterine vessels on the floor of the pelvis. At this juncture a large flat vessel, one centimetre in diameter, resembling an engorged vein, was exposed for about seven centimetres of its length on the anterior surface of the lower pelvic mass. Its course was toward the cornu uteri, where it disappeared among the congeries of dilated veins (Fig. 1).

A careful examination of the vessel was made and its resemblance to a ureter spoken of, but as the upper extremity appeared to run directly into the tumor among the vessels, the conclusion was drawn that it was one of the enlarged veins so often seen in these cases; it was therefore doubly ligated and cut. The nature of the error was apparent as soon as it was severed, as its patulous lumen and thick walls showed it to be the ureter. This opinion was confirmed by passing a sound downward into the bladder, and upward over the pelvic brim toward the kidney. The ureter was enlarged to about four times its normal diameter, forming a well-marked hydroureter,

a condition not infrequently found resulting from the pressure of large myomata. On removing the upper ligature, about twenty cubic centimetres of clear urine escaped.

While deciding how to deal with this complication I continued the operation and ligated the uterine vessels on either side low down on the pelvic floor. The tumor masses, together with the body of

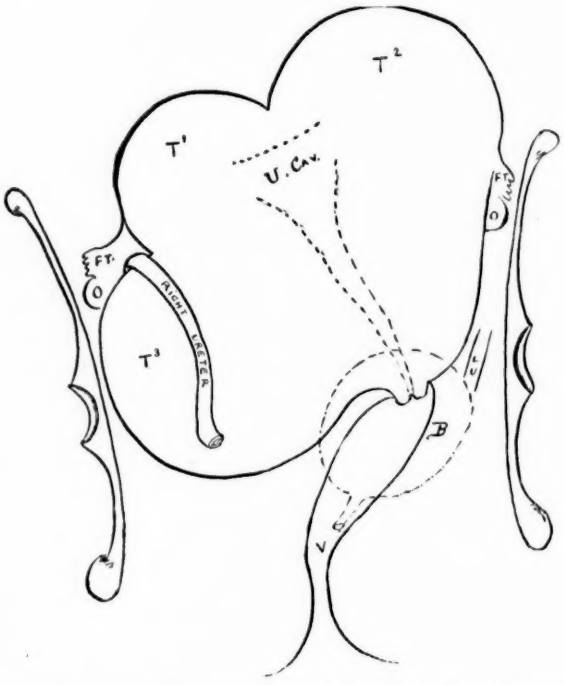

FIG. 1.—Coronal section of pelvis, T^1, T^2, T^3 myomatous uterus. Right ureter seen running over top of large myomatous nodule, T^3, vagina, bladder and cervix drawn upward and displaced to left, L. U., left ureter in normal position, FT., O., Fallopian tubes and ovaries.

the uterus, were removed by an incision through the cervix. The cervical canal was disinfected with pure carbolic acid and the flaps of the uterine stump approximated by a few silk sutures (Fig. 2).

I then turned my attention to the cut ureter. There were manifestly three possible modes of treatment, either to bring the upper end out through an opening in the flank or the middle line of the abdomen and thus establish a urinary fistula, or to remove the

right kidney, or to attempt the bolder plan of anastomosing the divided ends.

Although not aware that a successful anastomosis of the ureter had ever been accomplished in the human subject, I felt that I could undertake with considerable confidence a plan devised and practised successfully upon the dog by Dr. W. Van Hook, of Chicago, and which I had previously considered in this connection.

Dr. Van Hook's method consists in tying the lower end of the ureter and then making a slit into it below the ligature. He then invaginates the upper end into the lower through this slit.

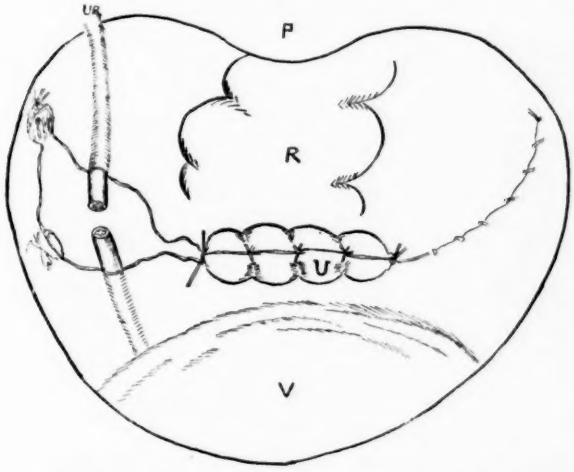

FIG. 2.—U. flaps of uterine stump approximated with interrupted silk sutures. Peritoneal layers of broad ligament approximated with continuous silk suture on left side; right side lying open, exposing cut ureter; R, rectum; V, vesica.

Proceeding according to this method, I first ligated the lower end of the ureter close to its cut extremity, and made a longitudinal slit one centimetre in length, in its anterior wall a half centimetre below the ligature.

A fine silk suture was then passed through the posterior wall of the lower portion from without inwards, a half centimetre below the lower angle of the slit; this was brought out through the slit and caught in the outer coats of the upper portion of the ureter two millimetres from its end and then carried back into the slit emerging

through the wall of the ureter close to the original point of entrance. (Fig. 3.)

A second suture was passed at a point directly opposite, catching the upper end in a similar manner.

By making traction on these sutures while holding the slit open the upper end of the ureter was readily invaginated into the lower. These sutures were snugly tied, and in order to avoid the risk of urine backing up through the slit, the edges were sutured to the intussuscepted ureter with about ten fine silk interrupted rectangular sutures, catching only the outer coats. The anastomosis was thus completed. (Fig. 4.)

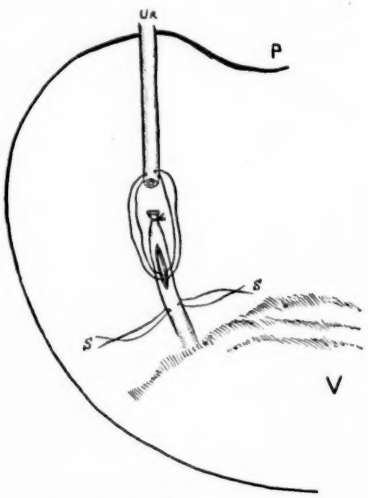

FIG. 3.—Right half of pelvis. Traction sutures, S. S., in place ready to invaginate upper end of ureter into lower.

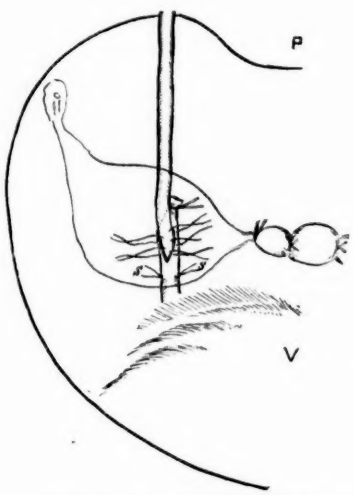

FIG. 4.—Upper portion of ureter invaginated into lower; traction sutures S. S., tied; lateral fixation sutures in place.

The loose peritoneum in the anterior part of the pelvis was now drawn over the field of operation and attached to the posterior surface of the stump and the broad ligaments by a continuous suture, except at the point where the ureter was united. Here two pieces of iodoform gauze were laid over the anastomosed ends and brought out at the lower angle of the abdominal wound, to insure drainage of the urine in case the operation was unsuccessful. The remainder of the abdominal incision was closed in the usual manner. During the first day

after operation the patient was catheterized every few hours to prevent the possibility of the urine in the bladder backing up against the anastomosis. On the second day she passed urine voluntarily, after which the catheter was no longer used. At no time was there the slightest urinary odor on the dressings, and on the third day the gauze drainage was removed. The sutures were removed on the eighth day. Union *per primam* throughout. The abdomen remained flat, the patient had no nausea, and the convalesence throughout was uninterrupted.

Albumin was present in considerable quantities before the operation, but at no time following the operation was there more than a

FIG. 5.—Sketch from alcoholic specimens of anastomosed ureter from the dog. Lumen split and held open by pins. Point of anastomosis in centre.

trace, and the urinary record indicates only a faint trace at the time of her discharge. The amount of urine excreted was less than 500 cubic centimetres for nine days ofter operation, not allowing for an uncertain quantity lost at stool. On the twenty-seventh day after operation, she was excreting 1080 cubic centimetres, and on the forty-second day 1120 cubic centimetres.

She was allowed to get out of bed on the seventeenth day, and was discharged in excellent health six weeks after the operation.

I reported this case at the Johns Hopkins Hospital Medical Society, October 9, of this year. Dr. Bloodgood, Resident

Surgeon of the Hospital, was happily able to illustrate my remarks graphically by producing at the same meeting of the society the anastomosed ureter of a dog, operated upon by him in a similar manner two and a half months previously. In this case the function of the ureter was not in the least interfered with. Its lumen was not lessened at the point of anastomosis, there was no dilatation or hydroureter above the anastomosis and there was no affection of the kidney of that side.

I am indebted to Dr. Bloodgood for the following notes and sketches which he has placed at my disposal:

"*Anastomosis of the Right Ureter in a Dog.*—Exhibition of the kidney and ureter removed two and one-half months after the operation. No dilatation of upper portion of the ureter, no stricture at the anastomosis and perfect restoration of the continuity of the canal and mucous membrane." (Fig. 5.)

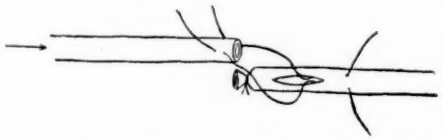

FIG. 6.—Traction sutures in place; these sutures pass through posterior wall of ureter but once.

"Operation, July, 1893.—Large dog; ether and morphia narcosis. A long incision was made in the right side, opening the abdominal cavity. The peritoneum was torn open, exposing the right ureter. The ureter was lifted from its bed and severed ten centimetres from the bladder."

"After ligating the lower end a longitudinal incision was made in its ventral wall 1.5 centimetres long, beginning .5 centimetres from the ligature. Two black silk sutures were passed through each lateral wall of the lower ureter through the longitudinal incision, and out through the lateral wall." (Fig. 6.)

"Using these two sutures as tractors and with the aid of a probe the upper ureter was drawn into the lumen of the lower, through the longitudinal incision and the sutures tied."

"Two additional sutures were passed through the lateral walls (not including the mucous coat) where the ends overlapped (Fig.

7). The anastomosed ureter was dropped back into its bed and the abdominal wound closed. The dog made a perfect recovery, without untoward symptoms."

"October 7, 1893, dog was again etherized and the kidney and ureter removed through a median incision. The kidney was normal and the upper end of the ureter was not dilated. The lower portion

FIG. 7.—Ureter anastomosed; traction sutures tied and two fixation sutures in place ready to be tied.

FIG. 8.—Longitudinal section of ureter showing new lumen and diverticulum.

ended in a blind sac at the point of ligature. The upper portion anastomosed with the lower in a slight curve. There was no stricture and the mucous membrane was continuous." (Fig. 8.)

"There was some difficulty in invaginating the upper portion into the lower; to obviate this a long incision was made. Bleeding from the artery accompanying the upper portion of the ureter caused some inconvenience."

THE EXTIRPATION OF ANEURISMS.[1]

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THERE are a few morbid conditions affecting the human frame which appear to possess an abiding charm for medical men from generation to generation, and from century to century. Among them may be mentioned stone in the bladder, hernia and aneurism. The greater rarity of aneurisms, and its always impending tragic termination by rupture, have given it an interest peculiarly its own. Hence is it that the pathology, relative liability of different arteries, symptomatology and diagnosis are all but completed chapters. With the proximal deligation of Anel and the apparently more rational procedure of Hunter, the operative therapy of aneurisms of the extremities seemed perfected. Less heroic, though by no means harmless methods, have been devised; some, like the injection of wax or of blood-coagulating chemicals, only to be remembered in the repleteness of history; others to be followed by success often enough to warrant a trial, yet not often enough to make it other than a surprise. Among these may be mentioned galvanopuncture, flexion, direct elastic and digital compression.

Certain is it that in the great majority of peripheral aneurisms the question of operative interference must be solved by selecting one of three methods. They are: (1) Proximal ligation at a point immediately above or some distance removed from the aneurism. (2) Splitting and emptying the sac with peripheral and proximal deligation. (3) The total extirpation of the aneurism.

[1] Read before the Surgical Section of the American Medical Association, June, 1893.

The first and second of these methods are sufficiently well known. The third, although described by Purmann 200 years ago, had fallen entirely into oblivion until five years ago. The most recent of our text-books but mentions it. It is for this reason that I beg to direct the attention of my colleagues to this ideal method, and to use for my text the following cases, one from my own, the other from the practice of my friend, Dr. L. Freeman.

CASE I.—Merman S., aged twenty-two. Seven months before admission to the Avondale Hospital fell on the left hand and fractured his thumb. States that shortly after the accident he observed a pulsating tumor over the wrist. Has been treated in dispensary and in hospital by elastic bandage and compression.

Present Condition.—On the left forearm, two inches above the wrist-joint, is a pulsating tumor as large as a hickory-nut. It has deep attachments, pulsates uniformly, and is clearly aneurismal; compression of the radial arrests its pulsation. Forced flexion of the forearm also accomplishes it.

April 19, 1893. Forearm flexed on arm, and maintained in this position by bandage for two hours. Pain necessitated removal for one-half hour. Bandage replaced and flexion maintained for three hours. Then, finally, removed. Pulsations returned within a few minutes.

April 21, 1893. Pad placed on radial artery above aneurism and by means of continuous pressure by nurses, all pulsation was checked for three hours. Aneurism had decreased in size about two-thirds, but within an hour was of original size.

April 25, 1893. *Operation.*—Incision three inches long over tumor. Surface of tumor readily exposed, and radial artery traced upwards and ligated with silk twice at each end of the sac. Artery then divided. To remove the sac in its entirety a portion of the tendon of the radial flexor of the wrist was sacrificed. Pulsations did not cease after the ligatures above the sac were brought home. The operation was a dry one. No drainage; catgut suture.

Result.—Union by first intention, and under one dressing. Function unimpaired.

Remarks.—The aneurismal sac presents a smooth intima. The sac wall has the thickness of a normal artery. Microscopic examina-

tion reveals all the arterial coats in the section. It is to be remarked that whereas compression of the radial at first checked pulsations, the anastomotic circulation was so established thereby that at the time of operation such compression no longer affected the tumor.

CASE II.—I am indebted to Dr. L. Freeman for the report of this case. A. B., aged twelve, was injured just over the ankle by an ice-pick. The wound healed without untoward symptoms. Several months later a pulsating tumor developed. Globular in shape and large as the end of the finger it presented a slight cicatrix on its dome. Under pressure the tumor disappeared, and compression of the femoral checked pulsation. Diagnosis. Traumatic aneurism.

Operation.—Incision over tumor, three inches long. A well-developed sac was found, and by tedious dissection severed from its connections. Ligature above and below. Suture without drainage. Recovery uninterrupted.

Though the aneurism in each of the cases was small and involved a part where a parallel vessel assured the nutrition of the parts beyond, the results achieved justify the use of the word ideal to designate the method of treatment by total extirpation. When resorted to for the relief of aneurisms of larger trunks like the axillary, brachial, femoral and politeal, the adjective is none the less appropriate. By briefly comparing the advantages and the disadvantages of the three operative methods of operation, the reasons for my greater faith in one will be best elucidated.

The acknowledged advantage of the Hunterian operation is its simplicity. It is performed in parts undisturbed in their anatomical relations. It is formal and quickly accomplished. The wound is easily kept aseptic, and the recovery is rapid. That the operation is made in a more healthy part of the artery is largely assumption. In traumatic aneurisms, and in those of arterio-venous character, this view is clearly untenable. In the idiopathic variety the danger of meeting the dreaded atheroma, the supposed source of secondary hæmorrhage ought certainly to increase as the heart is approached. Bowlby and C. O. Weber failed to find it oftener just above the aneurism than at a distance above it. Furthermore, the danger of gangrene increases with the stretch of artery cut off from the circulation between the

aneurism and the point of ligation. For these reasons the beneficent influences of modern wound-treatment have failed to decrease the mortality of aneurisms treated by proximal ligation according to Hunter as much as was expected.

While it is true that in 1881 Stimson was enabled to collect in New York twenty-nine cases of ligaturing of the principal arteries with catgut without secondary hæmorrhage and with but one case of gangrene, statistics drawn from wider sources are not nearly so favorable. In 1885 Scriba tabulated ninety-six cases treated antiseptically; twenty-four of these terminated fatally; seven through sepsis; seven through secondary hæmorrhage; in four through hæmorrhage from rupture of the sac; in two through gangrene; in one through embolism of the middle cerebral artery; and in three from unknown causes. In eight additional cases amputation had to be resorted to for gangrene of the extremity. Delbet places the mortality of proximal ligation at 18 per cent.

The presence of the sac after the Hunterian operation is a menace to the limb. By a too rapid establishment of the collateral circulation soft clots may be washed into distal branches, thereby producing localized patches of gangrene. Bardeleben detected this blocked condition of the vessels after the ligation of a healthy femoral artery for popliteal aneurism. Months after ligation trophic changes from implication of nerves in the sac wall may necessitate amputation.

Proximal ligation for aneurism always entails uncertainty concerning the finality of the cure. In not a few cases recurrence ensues after a few months or many years. Davies-Colley, Annandale and Hutchinson have reported cases in which the aneurism returned three, four and seven years after a supposed cure had been effected. In forty cases of total extirpation collected by Kubler the Hunterian operation had been done in five. It is particularly in traumatic aneurisms of arteries with generous anastomoses that there is danger of recurrence or of secondary hæmorrhage after proximal ligation. The glories of the Hunterian operation probably belong to the immediate past.

In recent years attention has, therefore, centred in the old

operation of Antyllus as revived by Syme. It comprises the splitting of the sac, the removing of clots and the ligation of the artery above and below. By the use of the tourniquet the chief danger, that from hæmorrhage during the operation, has been almost removed. The sources of failure are in the sac itself. It is virtually a foreign body, remaining in a large and irregular wound. Deprived of its nutrition, suppuration and sloughing are often unavoidable. In the course thereof secondary hæmorrhages may be expected. A further source of this bleeding is in the many vessels which are within the walls of and open into the sac itself. They are the *vasa vasorum* enlarged by the development of an anastomotic circulation in consequence of operative measures like digital compression or ligation, or from the unaided efforts of nature to overcome the disastrous effects of the diseased vessel on the nutrition of the parts below. Notwithstanding these defects of the method under consideration, its mortality is decidedly less than that of proximal ligation. Delbet places it at 11 per cent. Scriba has collected thirty cases, of which only three terminated fatally. One of the unsuccessful cases should be excluded, since the operation was limited to the splitting of the sac and tamponing with perchloride of iron. In two of the cases only did gangrene occur. The danger from gangrene is placed by Delbet at a little less than 3 per cent., whereas for proximal ligation it is nearly 8 per cent.

Favorable as are the results from the Antyllus operation, they do not equal those obtained from the total extirpation of the sac, an operation to which attention has recently been directed by Scriba, Delbet, Trelat and Kubler, to whose experiences I am largely indebted for the views herein expressed. Practised by Philagrius of Macedon in the fourth century, it was forgotten until the end of the seventeenth, when it was resorted to with success in a brachial aneurism by Purmann. It is generally designated as the operation of Purmann. A method might certainly be called ideal which in forty cases was followed by but one death, and after which gangrene and secondary hæmorrhage were not at all observed. The one death resulted from acute anæmia several hours after an operation made by Socin for aneurism of the scalp. In twenty-four of the cases

large arterial trunks like the axillary, brachial, femoral and popliteal were involved. In the very latest literature I have been enabled to find four more cases of popliteal aneurisms similarly treated, thus making twenty-eight extirpations of major aneurisms of the extremities without a death.

Of the forty-six cases, including those of Kubler, the four just referred to and the cases above reported, thirty-one were traumatic and fifteen spontaneous. Twelve were arterio-venous, the remainder arterial. The presence of a sac in recent traumatic aneurisms has been questioned. Nevertheless Trendelenburg found one in an injured femoral artery as early as the sixth day. While in such cases of recent traumatic aneurism the mere incision and double ligation may answer, it certainly seems better surgery to insure that retraction of the arterial stumps into the sheath above and below which is so essential to safe occlusion of their lumina. This applies particularly to the distal end from which secondary hæmorrhage, if it occurs at all, is more likely to ensue.

The disadvantages of total extirpation are the difficulty of its execution and the danger of wounding important parts to which the sac has formed adhesions. The first of these is not greater than that which attends the removal of tumors of the same size with adhesions. Under the artificial ischæmia obtained by the rubber tourniquet, a careful dissection of the sac wall is made through an ample incision. The smaller vessels are ligated as encountered before they are divided. The afferent and efferent vessels are sought, ligated and divided above and below the sac. To accomplish this it may be necessary to divide the sac in its long axis. It is in the dissection of the deeper portion of the sac that the attending vein may be injured. The danger from this accident has certainly been overrated. From the table of Kubler it appears that the femoral vein was injured in three cases, the popliteal in five, the axillary in one and the brachial in three. In all but one of these the vein was ligated or resected, but gangrene did not ensue. The supposed disadvantage of ligating an unhealthy part of the vessel has already been seen to be largely assumption. Fifteen of the cases were spontaneous aneurisms.

The advantages which make extirpation, in the words of M. Trelat, uttered in the French Surgical Congress of 1889, the operation of the future, are manifold. It is radical. It permits of the ligation of all vessels which could give rise to secondary bleeding. The danger from cicatricial contraction of the sac and the consequent involvement of nerve-trunks is averted. The wound, being a clean one, is, like that after the removal of a neoplasm, likely to unite by first intention.

Based on the foregoing, I beg to submit for your consideration the following propositions regarding the operative treatment of aneurisms of the extremities:

(1) Extirpation is the ideal method. It should be resorted to unless there are weighty reasons against it.

(2) In aneurisms of the fore-arm and of the leg no other method should be adopted.

(3) Aneurisms which have suddenly grown large from subcutaneous rupture of the sac, and those in which rupture is impending, should be subjected to extirpation.

(4) In recent traumatic aneurisms the injured vessel should be divided between two ligatures; when a sac has formed it should be excised.

(5) When other methods have failed, extirpation should be tried before resort is taken to amputation.

(6) In arterio-venous aneurisms extirpation should be practised, if any operation is indicated.

(7) Proximal ligation is to be reserved for cases of idiopathic or spontaneous aneurisms in which the age of the patient or an enfeebled condition from other causes would make a prolonged operation hazardous, and for cases in which the positiou of the tumor precludes the possibility of extirpation.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 25, 1893.

ARPAD G. GERSTER, M.D., President, in the Chair.

CASE OF TUBERCULAR PERITONITIS, TREATED BY ABDOMINAL SECTION, AND IODOFORM GAUZE TAMPONADE; RECOVERY.

Dr. CHARLES K. BRIDDON presented an Italian woman who had come under his care in June, 1893.

Her present trouble began two months before date of admission, with fever and malaise, which was soon followed by abdominal pain, diffuse, constant in character, but with evening exacerbations. Her temperature on admission was 99°, pulse 72, respiration 20. Abdomen was slightly but uniformly distended and resistant. To the right of the median line, and just below the level of the umbilicus, some dulness, and an ill-defined mass, most marked above, and gradually fading off toward the pelvic cavity. The data were not regarded as sufficient to warrant a diagnosis, and an explorative operation was advised and accepted by the patient. This was done on the following day under the influence of ether. Incision, median, below the umbilicus, five inches. Opening the peritoneum gave exit to a few ounces of fluid, which apparently escaped from a cavity formed out of the neighboring adhesions. The intestines were bunched together in one mass. Above, the omentum was adherent to the intestines, and by its superficial surface to the anterior abdominal wall. Laterally, the intestines were everywhere fixed to the parietes. All the non-adherent surfaces were studded with small miliary granulations. A small portion of peritoneum was removed for examination by the pathologist, Dr. Thacher, and pronounced by him to be tubercular.

The adhesions were not disturbed. The wound in the abdominal wall was left open, and dressed with a tamponade of iodoform

gauze, which was removed and redressed on the fifth day. She was discharged August 29, cured, and is now, October 25, in perfect health, with no discernable trace of the pre-existing disease.

Dr. PARKER SYMS said that about two years ago he had been surprised by the cure of a patient with tubercular peritonitis following an exploratory operation for the diagnosis of an abdominal tumor, and he had been led thereby to inquire into the literature of the subject. His case was very similar to that of Dr. Briddon. The condition found was quite inoperable. There was complete general involvement of the peritoneal cavity and its contents. He closed the abdomen and supposed the young man would die of the disease, but instead he got well. Koenig had made a careful study of the subject, and according to his investigations it appeared that about 60 per cent. of patients whose abdomens had been opened and closed without further interference were apparently cured, and that in 25 per cent. the cure was permanent, assuming that two years' immunity meant permanent cure.

OSTEOPLASTIC OPERATION FOR RESTORATION OF DEPRESSED NOSE.

Dr. FRED. LANGE presented a case showing the result of an attempt to form a bony bridge for the nose by an osteo-periosteal flap turned down from the forehead. The case was similar to one which he presented at the last meeting, only in this instance the destruction was greater, nearly the entire nose having disappeared from the face. A very small remnant of it had remained, and had been drawn into the nasal cavity by cicatricial contraction, and a small nipple-like protrusion existed, corresponding to the tip of the nose.

What is now seen is the result of rather a complicated way of operating. The essential steps were: (1) The separation of the remnants of the soft parts from the lateral bony walls. (2) The formation of a flap from the cheek, which was turned inward into the nasal cavity in order to prevent further cicatricial contraction. (3) The separation of the soft portion, from the region of the former nasal bones, its dislocation downward, with the skin surface looking toward the nasal cavity, the raw surface upward. (4) Bringing down from the forehead the osteo-periosteal flap to form the bony bridge of the nose. (5) Turning down a large skin-flap from the forehead after the usual method to cover the raw surfaces.

In spite of some suppuration and separation of a number of bony spiculæ, still enough bone remained to form a firm bony bridge. The cosmetic effect could still be improved upon.

He had observed in dissecting with the chisel the osteo-periosteal flap, that it can be given in the act of dissecting a concave-shape which presents its convex rear-side forward if turned down. It seems that this shape of the bone bridge had been preserved. There seems to exist a slight mobility of the new nasal bone with the os frontis in lateral direction. Against a downward pressure it seems to offer a firm resistance. The operation was done more than six months ago.

CYSTS OF THE MAMMÆ IN MALES.

Dr. F. W. KAMMERER presented a specimen taken from a man, forty-five years of age, who had noticed a tumor in the left breast for several months. The tumor, when removed, was found to be composed of two cysts that contained bloody serum and papillomatous growths, evidently malignant. An incision into the axilla revealed no glandular affection. The speaker had been able to find only two similar cases in literature.

Dr. WOOLSEY said that last winter he had occasion to remove a recurring cancer of the breast in a man on whom the primary operation had been performed in Boston. He was about forty-five years of age, a silversmith, and gave as a reason for the development of the growth the fact that in his trade pressure was exerted upon the right side of the chest. The appearance of the growth was like that of recurrence in the female breast, the nodules occurring in and beneath the skin on either side of the cicatrix. Dr. Woolsey operated upon the man twice. Finally the wound healed mostly by cicatrization, as he was unable to induce skin grafts to take.

Dr. PARKER SYMS said he had had a case of cyst of the mamma in the female, with malignant degeneration. He had made the diagnosis of carcinoma of the breast, although absence of retraction of the nipple gave rise to slight doubt about the diagnosis. To his surprise and chagrin he found on removing the tumor that it was a cyst, but his conscience was relieved by the fact that the microscope proved the presence of carcinomatous degeneration in one portion of the cyst.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 8, 1893.

ARPAD G. GERSTER, M.D., President, in the Chair.

ŒSOPHAGEAL STRICTURE CURED BY CUTTING WITH A STRING.

Dr. ROBERT ABBE presented the second patient on whom he had operated by this new method, a child three years of age, upon whom he had operated last June for impermeable stricture of the œsophagus by cutting with a string, after the manner practiced in a case presented about eight months ago (see ANNALS OF SURGERY, April, 1893, p. 489). This child swallowed half a cupful of caustic alkali six months before it was brought to him. There had been bloody discharge from the throat for some weeks, followed by inability to swallow even milk. The emaciation became extreme. Being unable to pass even the smallest instrument down the œsophagus, the reporter performed gastrostomy, and from below was able to pass upward a very fine filiform bougie without much trouble, bringing with it a string up into the mouth. He then succeeded with the aid of this string in passing very small conical bougies, dilating the stricture after Billroth's method up to the point where it was impossible to stretch further, which was only a small catheter size. He then attached a string to a bougie, brought it out through the mouth and with it performed œsophagotomy, by see-sawing it up and down, while a larger conical bougie was pressed hard into the stricture from the stomach, thus cutting the strictured portion until the size had been reached which he thought the child's œsophagus would stand with safety. Only a few drops of blood were lost. The gastrostomy wound was then closed. After a few days dilatation was begun, and kept up daily for a time; at present it was being repeated every other day. The child now swallows all kinds of solid food, and is strong and healthy.

Dr. Abbe said the patient whom he had first operated upon in this manner last year still remains in perfect health. The largest œsophageal tube that is made is still being passed weekly by the patient.

STAB WOUND OF THE ABDOMEN, WITH MULTIPLE WOUNDS OF THE INTESTINE; OPERATION; RECOVERY.

Dr. L. A. STIMSON presented a man, aged eighteen, who had entered the Chambers Street Hospital, the morning of October 10, having been stabbed in the abdomen with the large blade of a penknife at eight o'clock the same morning. The wound was a little below and at the right of the umbilicus, and was about half an inch in length. The patient seemed comfortable, made no complaint, showed no signs of collapse, and the wound seemed to have been limited to the abdominal parietes. The unly unfavorable sign was marked pallor, but the orderly who had seen the patient's mother said her complexion was the same, so that no inference could be based on that peculiarity. The pulse, however, was small and wiry, so that Dr. Stimson thought it best to explore the wound, which was done after the administration of an anæsthetic, and was found to have penetrated the abdomen. On opening the belly more than a quart of free blood was found in it, three incised wounds of the small intestine, each about a third of an inch in length; two wounds of the omentum and one of the mesentery, which had furnished the blood. The wounds were closed by a single row of silk Lembert sutures, and the patient made an uninterrupted recovery, but retained his waxy color.

Dr. MCBURNEY queried whether surgeons are not sometimes too slow in resorting to exploratory incision of the superficial parts in order to determine the exact nature and extent of wounds of the abdominal walls. He thought the tendency is, judging by what is said and printed, in the direction of delay, whereas the only way of assuring one's self of the true condition of things is by exploration through an incision. Dr. Stimson had spoken of the difficulty of deciding before operating whether his patient had a serious internal injury or was only suffering from emotional shock. It has been often noticed that in cases of small wounds of the abdomen it is very difficult to say whether the peritoneal cavity has been opened or not

unless one is able to pass a probe readily through the abdominal parietes. It is better to open up the wound, beginning with the superficial tissue and splitting up the walls layer by layer, and thus determine without damage to the patient whether the injury has reached the abdominal cavity. Such a rule, it seems to him, would be a sound one.

Dr. WYETH inquired of Dr. McBurney whether he would put off the preliminary incision until after reaction from shock, if shock existed.

Dr. MCBURNEY said his reply would be the same as if the wound were at some other part of the body. It was not usually a question of an hour or two. He would, of course, wait until the patient was in proper condition for examination, unless the indications were clear that immediate action should be taken.

Dr. ABBE thought that if there was fear of shock from a prolonged operation, etherization, etc., cocaine might be used for a moderate laparotomy to determine the essential points. In one case of stab-wound over the stomach in a man, he used twelve drops of 2 per cent. solution of cocaine, made a two-inch incision, explored the entire anterior surface of the stomach with perfect satisfaction, and, finding no interior injury, closed the abdominal opening and the man recovered.

Dr. MCBURNEY replied that he did not like a combination of ether and cocaine, which might be made necessary if the intestine were found to be wounded, calling for the substitution of ether for cocaine.

PISTOL-SHOT WOUND OF THE ABDOMEN; OPERATION; RECOVERY.

Dr. STIMSON, in connection with the former case, related another, that of a large, strong man, aged fifty-five, who, on the thirtieth of October, walked into the Chambers Street Hospital and said that a short time before a man had shot him in the abdomen with a pistol, 44 calibre, at short range. The wound was found to be a large, ragged one, a little below the level of the umbilicus and nearly directly above the anterior superior spine of the ilium. Considerable cloth was missing at the hole in the clothing. He had walked into the hospital and it required some persuasion to keep him from going home before the wound could be explored. The bullet

had perforated the sigmoid flexure in two places, had struck the ilium and lay loose under the iliacus muscle. Clothing and fæces and a little blood were removed, the wounds in the colon were closed and the track drained with a tube and iodoform gauze. The patient made an uninterrupted recovery.

Dr. Stimson said the point which he wished to emphasize in the two cases was the entire absence of acute symptoms, or symptoms of collapse, which not infrequently exist in penetrating wounds of the abdomen. He remembered the case of a person who had been struck in the abdomen by a bullet, was brought to the hospital apparently moribund, and on examination the bullet was found in the clothing, not having penetrated the skin at all. The collapse had been emotional. Collapse seemed often to depend more upon the circumstances of the shooting than upon any visceral injury. Dr. Stimson has had five cases of laparotomy for penetrating wound of the abdomen, with three recoveries.

Dr. GERSTER said he would emphasize the necessity for ascertaining the exact condition of things after injuries of the abdomen, irrespective of the seeming condition of the patient. He recalled a case which occurred last winter in a boy who had been shot in the abdomen, who had been brought to the hospital apparently in good condition, having no symptoms of shock, internal hæmorrhage or escape of fæces, yet when the abdomen was opened six hours after the injury, three perforations were found, two in the small intestine and one in the large intestine. Fæcal matter had escaped, and there was beginning intense local peritonitis. He disinfected the peritoneum thoroughly, applied intestinal sutures, and treated the wound openly in order to afford as free drainage as possible, but the patient died of septic peritonitis within twenty-four hours of the operation. Had the operation been performed earlier, the chances of recovery would certainly have been better. In this case simple probing of the wound yielded no information whatever. It was necessary to slit it up in order to determine whether the bullet had penetrated the abdominal cavity.

LACERATED WOUND AT THE ELBOW; SUTURE OF DIVIDED ULNAR NERVE WITH RAPID RETURN OF FUNCTION.

Dr. STIMSON presented a butcher who had entered the hospital the 24th of October, shortly after having received a wound of the

inner side of the arm, four inches long, just above the elbow, caused by slipping and catching the arm on a meat-hook. The ulnar nerve had been divided and six inches of the upper fragment hung dependent from the wound. The ring and little fingers were partly flexed, and the patient was unable to use them. The house surgeon at once made an incision in the forearm below the elbow, found the upper end of the lower segment of the nerve; then passed a probe through the track which had been occupied by the upper fragment and dragged this portion behind the epitrochlea to the lower segment and fastened the two ends together. The interesting point in the case was that the next day the patient called attention to the fact that he could move the hand as well as ever. The anæsthesia in the fingers also rapidly diminished, so that by the end of the week one could only say sensation was somewhat duller than normal. Dr. Stimson presumed the prompt return of nerve power was not to be attributed to primary union of the divided nerve, but to compensatory supply.

TWENTY-SIX CALCULI REMOVED FROM THE DEEP URETHRA.

Dr. STIMSON also presented twenty-six calculi which he had removed from the deep urethra in a man who had suffered during many years from organic stricture of the urethra.

Dr. WILLY MEYER said, with regard to the calculi presented by Dr. Stimson, that he thought they were not of the deep urethra, but of the prostate gland. He had removed fifteen small stones from the prostate, and such cases were not infrequent. The stones were easily shelled out of the gland with the finger.

SARCOMA OF THE KIDNEY.

Dr. ROBERT ABBE then read the paper of the evening upon "Sarcoma of the Kidney." (See page 58.)

Dr. CHARLES MCBURNEY endorsed heartily the position taken by Dr. Abbe with regard to the propriety of operating on cases of sarcoma, and even on carcinoma of the kidney where the conditions are such that a successful result is fairly probable. From the statistics now existing, the outlook is very encouraging, especially when is remembered the certainty of steadily advancing disease and disability with finally a fatal issue when the disease is left to itself. In carci-

noma of the rectum surgeons perform inguinal colotomy for the relief of the obstruction, although it is known that the patient cannot live longer than a year; surely there is greater reason for removing a sarcomatous kidney when one may thereby considerably prolong comfortable life.

He had never practiced the line of incision which the author had described, but he should agree with him most decidedly in the general principle of making an incision long enough to permit of free manipulation, and particularly in making the approach from the front. He had spoken on that subject before the society on a former occasion, and he now repeated that he was a very strong believer in the anterior incision, reserving the lumbar incision for the few cases in which the tumor is small and can be properly handled through a posterior incision. He believed, also, that a good many dangers connected with removal of smaller tumors of the kidney could be avoided by making a free anterior incision, longitudinal or lateral.

Dr. JOHN A. WYETH inquired whether the intestine had given any trouble by getting into the field of operation while the patient was in the Trendelenburg posture.

Dr. ABBE replied, not at all. The child was not only put in the Trendelenburg position, but was also turned on the side, so that the tumor was uppermost.

Dr. WYETH rejoined that he had been led to ask the question because it seemed to him that the position which the patient occupied was an important point in controlling hæmorrhage. In the two cases which he then recalled, in which he had removed kidney tumors, there had been great hæmorrhage, and he would be very glad if, by placing the patient in the Trendelenburg posture, this danger could be overcome.

Dr. F. KAMMERER remarked that he had in three cases, two in children, one in an older person, made the attempt to remove large sarcomatous tumors of the kidney without success. The first of his cases was in a boy of seven years. The tumor filled the greater part of the abdomen. The incision was made in the median line. There were adhesions of the omentum to the anterior surface of the growth, and in separating these some hæmorrhage occurred. During further manipulation a severe collapse came on, so that further efforts to remove the tumor had to be abandoned. He died of the disease some months later. The second case was in a man, aged forty-five. The operation, begun by an incision at the outer border of the rectus

muscle, had to be discontinued, and the patient died a few days later of shock. The third attempt was recently made at St. Francis' Hospital, in a girl, aged five years, in only fair condition. He again incised over the tumor to the outside of the rectus. Upon opening the abdominal cavity the descending colon lay exactly over the tumor, its mesentery was spread out and large vessels were seen to run from the gut in both directions over the tumor toward the vertebral column. Thinking that this condition did not warrant further interference, he closed the abdominal cavity, and the child recovered for the time being.

Judging from other personal experience with the transverse incision in nephrectomy, and especially in operations for impacted gall-stones, the speaker believed he might have been more successful in one or the other case if he had employed a transverse incision instead of a longitudinal one, more especially as he had now seen Dr. Abbe's encouraging cases. In large kidney tumors the question of extra or intra-peritoneal incision seemed to him to be a useless one. The proper way to deal with these tumors is a transverse incision in the lumbar region, extending, if necessary, beyond the reflection of the peritoneum upon the abdominal walls and opening the peritoneal cavity. This incision can be prolonged to the median, if more space is required. The freedom thus afforded in intra-abdominal work cannot be too highly estimated. The advantage of Trendelenburg's position in these cases seems to be the prevention of shock by lowering of the head, but a somewhat lateral position, with elevation of the region of the tumor, seemed to him the best for controlling hæmorrhage.

Dr. GERSTER said that he had employed a transverse incision in all renal operations during the last four or five years, and he had had every reason to be satisfied with it. It is incomparably better than the longitudinal one. The ordinary lumbar transverse incision used in ordinary nephrectomies could easily be extended to the median line in cases of large malignant tumors of the kidneys. In only one of his cases was the tumor malignant—carcinoma—in which case the growth was removed, but the patient died of thrombosis, which extended from the large veins, contained in the investment of the tumor to the mesentery of the transverse colon. At the autopsy the transverse colon had the appearance of beginning necrosis.

Dr. ABBE said that although the transverse incision across the abdominal muscles bleeds a little more, and is attended by some

retraction of the edges of the wound, it is, he believed, more favorable for the production of a solid scar than an incision outside the rectus muscle. In closing the latter incision one or two layers of the fasciæs are apt to slip back and not be grasped in the suture, causing a weaker scar. Where the muscle is cut across, however, deep cicatricial union takes place between the ends of the muscles, leaving, according to his experience, a more durable and solid scar than after a vertical incision.

He had always felt that the Trendelenburg position owed its advantages largely to the drainage of the venous blood away from the pelvis and site of the operation, an advantage which is enhanced in the cases under discussion, by placing the patient on the side as well as in the elevated position.

ENORMOUS TUMOR OF THE OVARY.

Dr. GERSTER presented a colossal solid tumor of the ovary which he had recently removed from a woman thirty-seven years of age, married eighteen years ago. Before marriage she had had one attack of peritonitis. Immediately after marriage it was noticed that there was a tumor in her abdominal cavity. She never became pregnant. Menstruation was always normal and free from pain. The tumor grew very slowly. In 1883 it had reached proportions where it began to incommode the patient, and she went to Erlangen, Germany, where fibroid of the uterus was diagnosed, and she was strongly dissuaded from any radical operation. She was there treated by the Apostoli method, without visible improvement, until she got tired and left. Since then she had lived in the far west in this country, the tumor growing steadily and slowly. Finally ascites was added, and her condition became unbearable. When first seen by the reporter she appeared to be in good general condition, in spite of the immense abdomen. As there had been no hæmorrhages, and the lungs and kidneys seemed to be in good condition, the case was not entirely hopeless. There was a marked facies ovariana and distinct pigmentation. On bi-manual palpation the movements of the tumor seemed transmitted to the cervix uteri, but not so markedly as one would expect where the tumor was closely connected with the body of the uterus.

In consequence of the enormous distention of the abdomen it was impossible to come to a positive conclusion as to the nature of

the growth. There was no fluctuation connected with the tumor. An incision was made, extending from the xiphoid to the symphisis pubis. The peculiar white appearance of the tumor showed at once that it was not a tumor of the uterus. Further examination of its relations showed that in all probability it was a solid tumor, connected with the left ovary, almost free from adhesions. The pedicle was fully as large as a man's arm, contained enormous vessels, and was deligated in ten or twelve parts and cut off. Then on lifting the tumor a considerable adhesion to the mesentery of the rectum was found, which also was divided into a number of masses and tied off, after which the enormous tumor was lifted out and the abdomen was rapidly closed. The first fluid which had escaped on opening the belly was bloody. The operation had been performed five days before, and the subsequent course had been entirely uneventful. Although the operation lasted an hour and a quarter, there was not the slightest shock sustained. The tumor weighed exactly fifty pounds. The pathologist reports that it is a fibro-sarcoma of the left ovary, with numerous calcareous masses which render it hard and dense. There was a small cavity in its interior, containing three or four quarts of fluid.

Dr. Gerster brought the case before the society because it bore upon the statement which gynæcologists make frequently, that it is not worth the surgeon's while to remove tumors after they have reached a certain size, as the patient will surely die. Such statements were refuted in the presented case, and it was refuted in another case which he had not yet reported, a case in which the tumor, an ovarian cystoma, weighed sixty pounds, and the patient was discharged cured in a fortnight. The tumor had been present a long time. The woman's general condition was good, and she was simply incommoded by the enormous size of the tumor. This woman had seen two or three specialists in the city, and all had advised against an operation. The reporter had proposed to make an exploratory incision with the intention, should the adhesions prove very firm and extensive, of closing the belly without further interference. It was predicted that he would meet with adhesions without end, and that to dissect out the tumor would be an impossibility. An incision of four inches was first made; then no adhesions appearing, he thereupon punctured the tumor, evacuated many pailfuls of fluid. Completed the operation in a very short time, and the patient made an uninterrupted recovery.

Dr. CHARLES K. BRIDDON stated that he regarded all these cases of large tumors as fit for exploratory incision. No one can tell anything about the adhesions without such procedure. He had seen many cases of large tumors where unexpectedly no adhesions were found; others where there were adhesions when the reverse was anticipated. He had within eighteen months removed a solid tumor from the abdomen weighing thirty-nine pounds, an incision being required which extended from the xiphoid down to the pubis. The connective tissue of the omentum had been absorbed, leaving only the enormously enlarged veins and lymphatics passing from the fundus of the tumor to the transverse colon. The veins conveying the blood from the tumor were estimated by some present and stated to have been an inch and a half in diameter, while the lymphatics were a quarter of an inch in diameter. There was no difficulty in removing the tumor. The veins were tied; the pedicle, which was long, was brought outside the abdominal cavity and was tied off. The woman did well until the seventh day after the operation, when she died suddenly in the night, from, as he believed, thrombus of the pulmonary artery, originating in coagula formed in the enlarged abdominal veins. Within the last three or four weeks he had removed a large solid tumor from a patient on whom a surgeon in this city refused to operate about ten years ago. Nothing could have been easier to remove than the tumor in that case, and the recovery was uneventful.

CASE OF INTESTINAL OBSTRUCTION FROM CARCINOMA OF CÆCUM.

Dr. F. KAMMERER showed specimens and related the history of a case of internal obstruction. The patient was a woman of fifty years, who had had five children. She was still menstruating every four weeks profusely. She had suffered from increasing constipation for the past six months. Five days before her admission to the hospital symptoms of acute strangulation had set in. There was vomiting, and castor oil and other purgatives had failed to act. Owing to considerable tympanites bimanual palpation of the abdomen was out of the question, and rectal palpation revealed nothing. Laparotomy was done in the median line. Upon opening the peritoneal cavity a gurgling sound was heard, and a loop of intestine, lying just below the abdominal parietes, was seen to recede to the left. Upon close inspection there was found a hard, evidently malignant tumor of the

right ovary, about the size of a large fist, lying in the median line just above this coil of intestine. It had a pedicle about two inches in length, which lay in an antero-posterior direction, and about which the above-mentioned intestinal loop was thrown. There was no adhesion here, and the latter readily receded upon slight manipulation from its abdominal position. The left ovary was found low in the pelvis, of normal size, but evidently also degenerated, and was therefore removed. The entire colon was, to all appearances, distended with gas, and its examination showed no further constriction. There were old adhesions at some parts of the abdominal cavity, more especially around the caput coli, but nothing abnormal was detected. Believing that the obstruction had been found, the abdominal cavity was closed. During the further course the symptoms of obstruction were not entirely relieved, but, as there was a rise of temperature during the first three days after operation, and as the patient had had a fair movement of the bowels on the second day, the diagnosis between acute peritonitis and unrelieved obstruction was not made. There was one suspicious symptom, however; the continuance of peristaltic attacks, less severe than before operation, but still evident and incompatible with the intestinal paralysis of acute general peritonitis. On the fifth day the temperature dropped to normal, the tympanites became somewhat less, gases escaped from the rectum, when an enema was given, but no satisfactory amount of fæcal matter since the one movement on the day after operation. The speaker had intended to re-open the abdomen, but complete anuria beginning on the fifth day, and terminating the patient's life on the seventh, prevented this. The post-mortem examination showed that a circular, almost complete, constriction (malignant) at the cæcum, had been overlooked. Even then it was difficult to detect it among the adhesions at this point; it was only found after the parts had been removed from the body. The speaker thought that the lesion in the intestine was the primary one, and the deposits in both ovaries secondary (a very rare occurrence). Malignant degeneration in both ovaries, primarily, is not infrequent. Taken in connection with the status at the operation, this consideration encouraged the assumption that the real cause of obstruction had been found.

CASES OF NEPHRECTOMY.

Dr. F. H. MARKOE presented a female upon whom he had operated. The history was as follows: A. H., aged twenty, of healthy

parentage, had been seized in July, 1892, with sudden pain in both knees, which, radiating upward into the thighs, had caused the greatest discomfort on walking. This became more and more severe, and accompanied by irregular chills and fever supposed to be of malarial nature. About the middle of September a lump had been discovered in the right side of the abdomen just below the free border of the ribs. She had steadily lost flesh and strength, and when she entered St. Luke's Hospital in November, 1892, was in a wretched condition of emaciation and anæmia. Examination of the urine showed it to be acid, of a specific gravity of 1010 and to contain 3 per cent. albumin, 10 per cent. pus deposit, no casts.

Careful physical examination had proved negative, except for the presence of a round elastic tumor in the right flank, over which resonance was somewhat duller than over the rest of the abdomen.

An exploratory laparotomy by the attending surgeon then on duty confirmed the diagnosis of an extra-peritoneal abscess. A lumbar incision evacuated considerable pus and cheesy material. Little improvement had occurred, and of only temporary duration. As some doubt seemed to exist as to the site of the lesion, methylene blue had been administered by mouth, and its presence in the urine and in the discharge from the wound proved the kidney to be the seat of disease.

Soon after coming under the speaker's charge he had removed the kidney by a slight modification of Koenig's incision, which included the existing sinus.

She had been allowed up after three weeks. At about the sixth week the pedicle ligature of silk had been removed from the bottom of a sinus. Steady improvement had followed, and the patient was perfectly restored with a completely healed wound.

Dr. MARKOE also presented a large tuberculous kidney, removed September 12, 1891, by abdominal incision from a case upon whom supra-pubic cystotomy had been done by another surgeon to drain a bladder supposed to be the seat of cystitis and found normal. Death had resulted five days later from functional failure on the part of the other kidney, the operation wound being in satisfactory condition. The autopsy had shown amyloid degeneration of the abdominal viscera as the fatal factor.

He thought that in both cases unnecessary operations might have been avoided had the gentlemen under whose charge they first came availed themselves of cystoscopy for diagnostic light. Earlier opera-

tion might, too, have saved months of suffering, and in the last case possibly affected the ultimate result.

Dr. MARKOE also presented a kidney removed on April 28, 1892, after a preliminary nephrotomy for enormous pyonephrotic distention. The case had been referred to him as one of perityphlitic abscess, with the history that two weeks before he had been suddenly seized with a chill, prolonged and severe in character, followed by fever and great pain and tenderness in right hypochondrium. There had been no repetition of the chill, but high fever with increasing pain and tenderness had persisted.

When admitted to Bellevue Hospital physical examination revealed only a very large elastic mass, which filled the left side of the abdomen and encroached for some distance beyond the median line. The urine was loaded with pus.

An incision had been made just outside the right linea-semilunaris, and the mass identified as a distended kidney. Incision evacuated a very large amount of pus and urine, and revealed that the kidney was represented by a large abscess whose walls were not more than a line in thickness. Immediate improvement followed the nephrotomy, and three weeks later the kidney was removed through the original wound, enlarged by a second incision at right angles to its centre. Recovery had been uneventful. Unfortunately the patient eloped before a small sinus which marked the point of drainage had closed, and no further trace had been found of him.

The cause of the pyonephrosis had not been discovered.

ACUTE ASCITIC TUBERCULOUS PERITONITIS. LAPAROTOMY. RECOVERY.

Dr. F. H. MARKOE presented a patient with the following history: D. C., male, aged sixteen, had been admitted to Bellevue Hospital, May 14, 1893, because of abdominal distention and fever. Examination had revealed an abdomen distended with fluid in a patient with a febrile movement, ranging between 100° and 103° F. All the thoracic organs being apparently normal.

He had been placed in bed and watched for eight days. During this time he had lost ground steadily, and readily consented to operation. A median laparotomy showed the visceral and parietal peritoneum studded with miliary eruption. The great omentum was rolled

up, and together with the transverse colon, adherent as a sausage-shaped mass across anterior abdominal wall at about umbilicus. Several quarts of turbid, yellowish serum were evacuated, and the cavity thoroughly irrigated with warm borosalicylic solution. Complete closure of wound by tier sutures. Muscles and fascial planes being united by buried sutures of silkworm-gut. Uninterrupted recovery. Perfectly well, as far as can be ascertained, six months after operation.

The speaker had operated on several cases of tuberculous peritonitis, but only two of this acute variety. In the first case the patient, when last heard from, two years ago, was in perfect health, two years and four months having elapsed since the operation.

The diagnosis had been verified in both cases by microscopical examination of portions of the parietal peritoneum removed at the time of operation.

EDITORIAL ARTICLES.

CINNAMIC ACID IN THE TREATMENT OF TUBERCULOSIS.

THE failure of the tuberculin of Koch to satisfy the highest expectations has not deterred investigators from continuing to seek for remedies with which to combat tuberculous diseases. The results which have been obtained with cinnamic acid entitle it to a rank among the anti-tuberculous remedies. An instructive series of experiments with this drug have been carried out by Dr. Paul Richter in the private clinic of Prof. Landerer, in Leipzig.[1]

The experiments were conducted with ten rabbits as nearly alike as possible. These were injected in the veins of the ear with a fresh pure culture of tubercle bacilli dissolved in normal salt solution. On the eleventh day the first animal died. Post-mortem examination showed no gross tuberculous changes. A second animal died on the thirteenth day with a moderate number of tubercular nodules in the lungs. On the nineteenth day a third died with extensive tubercular deposits in the lungs and a few nodules in the liver; the spleen was not involved. From this time on treatment of six of the remaining rabbits was begun, it being assumed that these were suffering from tuberculosis. One was reserved as a control animal.

The same 5 per cent. emulsion of cinnamylic acid was employed as Landerer used on human subjects. In the beginning intra-venous injections of 0.1 to 0.2 grammes three times a week were made. After the third week the dose was gradually increased until 1.0 gramme was

[1] Histologische Untersuchungen über die Einwirkung der Zimmtsäuer auf tuberculöse Kaninchen. Virchow's Archiv. für Path., Anat. u. Phys. u. für klin. Medicin. Band CXXXIII, 1893.

reached. The amount was then reduced till finally 0.5 grammes was administered twice a week. This treatment was continued for six months.

After the infection the animals became greatly emaciated, and also during the beginning of the treatment showed little inclination to take food. They bore the injections well, and soon began to increase in weight. Two animals died spontaneously—one, very weak and emaciated, nineteen days after the beginning of treatment; and the second died of acute pneumonia in the seventh month. The rest of the animals had to be killed with chloroform. The untreated control rabbit died relatively late, living seven months after the injection. It would not be right to conclude that the original infection was not severe enough, for two of the animals died within nineteen days with pronounced tubercular deposits. A lack of uniformity in the course of the disease in the various animals cannot be prevented, for the number of bacteria injected into each animal could not be accurately regulated.

A thorough macroscopic and microscopic examination of these animals, treated with cinnamylic acid, shows as follows: First, an inflammatory area surrounds each tubercle, chiefly associated with capillary dilatation, extravasation of serum and local leucocytosis. Later, the nodule becomes surrounded by a wall of leucocytes, and at the same time multinuclear leucocytes begin to wander into the tubercle, and new blood-vessels are formed.

In a later period the tubercle is observed to be surrounded by a wall of young connective tissue, and at the same time a growth of connective tissue and blood-vessels into the tubercle takes place. Bacilli almost entirely disappear in this period. Finally this connective tissue becomes converted into cicatricial tissue, and shrinking occurs. Bacilli are now no longer present; and the animals during this time were well and regaining their lost flesh.

In the later stages of the disease the large tuberculous deposits cause the same changes as occur in the well-known processes observed in connection with necrotic areas and foreign bodies, which become encapsulated and penetrated by connective tissue.

From the above it will be seen that inoculation tuberculosis becomes much protracted when treated by injections of cinnamic acid. Treatment capable of keeping alive tuberculous rabbits for almost a year had before this not been known. Kitasato[1] stated in his observations with tuberculin, that he was able to keep alive for eleven weeks tuberculous guinea pigs, and regarded this as an evidence of the curative property of this tuberculin treatment.

The changes occurring in tuberculous animals, treated with cinnamic acid injections, is peculiar. Instead of the usual picture of numerous breaking down and cheesy nodules, with many bacilli, but few nodules are discovered, with a constantly diminishing number of bacilli, till finally staining fails to disclose a bacillus. Instead of the tendency to cheesy degeneration the nodules tend to become dense and fibrous. The fact that but little infection was found in the abdominal organs of these animals, depends not on the treatment, but on the manner of inoculation. Whereas guinea pigs are usually inoculated subcutaneously or intra-peritoneally, these rabbits were inoculated in the veins of the ear. With the latter, therefore, the first large viscus in which the bacteria become lodged is the lung, which so completely sieves out the bacilli from the blood that few or none reach the other organs.

The macroscopic and microscopic findings in the above cases very closely resemble the conditions described by Prudden, Hodenpyl and Vissmann, as occurring after the intra-venous injection of dead tubercle bacilli. The question arises as to whether, in the course of the treatment, a direct destruction of the tubercle bacilli is brought about by the action of the cinnamic acid. This seems not improbable, though the results obtained by Richter by experimenting with these substances in reagent glasses has been rather unsatisfactory.

Behring[2] discovered that cinnamon oil possessed marked antiseptic properties. The experiments which Richter has carried out with cinnamic acid, outside of the living animal body, fail to show

[1] Kitasato, Zeitschrift für Hygiene. Band XIII.

[2] Zeitschrift für Hygiene. Band V.

that the acid has any bactericidal action, and show that it hinders but slightly bacterial development. Experiments with pure cultures of tubercle bacilli, which were kept a whole day in cinnamic acid, showed that, after subcutaneous injection, these cultures were capable of producing rapid, local and metastatic tuberculosis.

Just how this acid acts on the tuberculous process seems difficult to say. Necrotic changes within the tubercles thus acted upon are less marked than those in untreated animals. Calcareous degeneration is also absent. The action of the drug is confined chiefly to the periphery of the nodule. It sets up an inflammation in the peripheral zone of the nodule, which results in the formation of a firm incapsulation. Within this capsule vital processes are so diminished that probably the bacilli perish from this cause.

Both tuberculin and cinnamic acid excite an inflammation about tuberculous nodules. These two inflammatory processes are quite different. The first is a rapid and very active change, with the formation of a rich area of round cells about the nodules; the latter is a more quiet process, and results in a deposit of dense fibrous tissue, shutting off the nodule from the surrounding tissue like a foreign body.

The discoverer of the therapeutic value of cinnamic acid in tuberculosis, Professor Landerer,[1] of Leipzig, has issued a small work in which he gives the methods of administering the drug, which he has found after two and a half years' employment in his clinic to give the best results. The treatment is neither complicated nor dangerous.

The cinnamic acid used by him is prepared from storax. It is a perfectly colorless, coarsely crystalline powder. Under the microscope the crystals are seen to be rhombic in form. It is feebly soluble in cold water, but freely soluble in hot water, alcohol, and warm oil. It dissolves without color. A cinnamic acid which is not absolutely colorless in hot water or alcohol forms a poor emulsion, because after a short time it deposits a gritty sediment.

[1] Anweisung zur Behandlung der Tuberculose mit Zimmtsäuer, Leipzig, 1893.

The emulsion employed by Landerer is as follows:

℞.	Acidi cinnamylici subtil. pulverisati,	5 gm.
	Olei amygdal,	10 gm.
	Vitelli ovi,	num. 1.
	Sol. natr. chlor. (0.7 per cent.) q. s.	
	ut fiat emulsio,	100 gm.

The preparation of this emulsion is important. The acid should be ground fine in a mortar. A little almond oil is then added, and the trituration continued. The rest of the oil is then rubbed in, and the yolk of one egg added, and the whole mass thoroughly triturated. The .7 per cent. sodium chloride solution is then added drop by drop, while the mixture is constantly stirred, until a weight of 100 grammes has been reached. The whole process should consume at least ten minutes. This mixture after standing a few days should remain homogeneous, and should deposit no crystals of cinnamic acid. If the emulsion does separate in the course of time it is still good. In the acid emulsion the crystals can still be seen under the microscope. They should not be larger than four times the diameter of a white blood corpuscle. Larger fat drops should not be present.

For alkalizing the emulsion a 7.5 per cent. solution of sodium hydrate is used. About five drops of this are added to the cubic centimetre of emulsion. It is important that the emulsion be made alkaline. A slight excess of alkali does no harm. The microscope should reveal no crystals in the alkaline solution. The emulsion should be kept in a cool place, and a new lot prepared weekly, though it will keep two weeks or longer. It cannot be sterilized. The acid emulsion will keep for a long time, but the alkaline quickly spoils; it is best, therefore, to add the soda only to as much emulsion as is required at the time.

The technique of the injection is simple. A perfectly sterile Pravaz syringe is necessary. The needle should be fine and very sharp. Before using it should lie fifteen minutes in alcohol, and then be washed with salt solution.

An elastic band is placed about the upper arm as in venesection.

The skin overlying the cephalic vein is cleansed with ether. The alkalinity of the emulsion should now be tested. The vein being made to stand out prominently, the needle should be introduced as nearly parallel to it as possible, till the lumen of the vessel is penetrated. When the needle has entered the vein it will be felt that it is freely movable in a cavity; and the emulsion can now be slowly injected. No pain, or nothing more than a slight burning sensation, which disappears on removing the band, follows the intravenous injection. If the fluid does not enter the vein a swelling will be observed.

No symptoms should appear immediately after the injection. Depression is a sign of too large a dose. Allowance must, of course, be made for nervous persons.

Injections into the gluteal muscles are made, the same as mercurial injections, into the upper and posterior gluteal region, avoiding the ischiadic nerve and gluteal vessels. A very sharp needle is not necessary.

In the very acute pulmonary tuberculosis of young people, Landerer has found that little is to be hoped for in the use of cinnamic acid. Cases of chronic tuberculosis without pulmonary cavities give almost an absolutely good prognosis. He has succeeded in improving 66⅔ per cent. of cases with pulmonary excavation when there was no considerable degree of fever.

After the fifth or sixth injection the patient begins to have the subjective feeling of improvement. After the first few injections, many patients feel tired and depressed. This feeling should disappear at least by the third week. Sweating gradually diminishes, and the appetite improves. Expectoration gradually diminishes after the fifth or sixth week. When no cavities are present, the bacilli in the sputa begin to disappear by the fourth or sixth week.

The size of the dose must be regulated by the strength of the patient. The weaker the patient, and the more extensive the disease in the lung, so much smaller should the dose be. Under any circumstance the treatment should be begun with small doses. The dose

should never be rapidly increased. It is best to begin with less than 0.1 ccm., and slowly increase the dose up to 0.25 or 0.4 ccm. Especially strong patients may be given 0.8 or 0.9 ccm. In advanced cases the dose should be held at 0.1 or 0.15 ccm. If the patient complains of uneasiness, pain in the head or chest, the dose should be diminished.

Landerer usually gives two injections weekly; but the best results are obtained when 0.1 or 0.2 ccm. are given every second day. This treatment should be continued in cases of pulmonary tuberculosis not less than three months, or at least a month after the bacilli have disappeared from the sputum. Very advanced cases have to be treated with small doses for nine months or longer.

Laryngeal tuberculosis he treats by painting the parts with cinnamic acid and alcohol, 1 : 20, or better, the acid with glycerin, 1 : 20 or 1 : 10, in conjunction with intravenous injections.

Intestinal tuberculosis is very tractable to this treatment. Small daily doses are administered beginning with 0.05 ccm. and increasing to 0.3 or 0.5 ccm. This is continued till the diarrhœa and tenesmus ceases and the patient's appetite returns.

The results obtained in genito-urinary tuberculosis have shown but slight improvement in this class of cases, though none have been treated longer than six weeks.

Meningeal tuberculosis has been experimented upon in only one case. The patient was already comatose, and a single injection was found to have no effect.

In lymphatic tuberculosis gradual hardening and diminution in the size of the nodules was effected. Two cases of pronounced tuberculous mediastinal tumors, with disappearance of the radial pulse, were very greatly improved, all subjective symptoms disappearing. The cases were observed for one and a half and two years respectively. In cases of broken-down nodules it is, of course, recommended that the necrotic material be removed. The cinnamic acid injections hasten the healing and insure against recurrence. With children the gluteal injections are also to be employed in these cases.

In other surgical tuberculous processes local and gluteal injections are used.

The dose for gluteal injection varies from 0.1 ccm. to 1.0 ccm. Here also the dose should be at first small and gradually increased. Dispensary patients are injected every third or fourth day; hospital patients every second day, or even five or six times weekly.

The local injection in joint tuberculosis is made directly into the fungous mass. Injections may be made into the joint cavity if it is diseased. When necessary the needle may be passed down to or into the bone. Beginning with 0.1 ccm., the dose is gradually increased to 0.4 ccm. or 0.5 ccm.

Injections are made into fungous masses every second or fourth day, and during the intervals gluteal injection is practiced. Before an injection into a tuberculous swelling is repeated, any swelling or pain caused by the previous injection must have disappeared. The more normal a joint becomes, the more easily pain is excited by the injections. In the case of very sensitive persons Landerer recommends the injection of 4 per cent. solution of cocaine in bichloride solution 1 : 10,000. The above treatment can be carried out in connection with immobilization or extension apparatus.

Tuberculous abscesses are treated by Landerer by evacuating with the trocar, washing out with sterilized .7 per cent. salt solution and injecting with 5 ccm. to 30 ccm. of sterilized 1 : 20 or 1 : 10 cinnamic acid in glycerin. The opening is then closed with a suture. Neither fever nor pain follows this operation. If no sequestrum is present the cavity shrinks and becomes obliterated. The injection must sometimes be repeated. Sequestra and necrotic tissue must always be removed.

Tuberculous fistulæ are treated with cinnamic acid in alcohol, 1 : 20, or in glycerin, 1 : 10 or 1 : 20.

Landerer's method of treating lupus consists in injecting the nodules with cinnamic acid and alcohol, 1 : 20, and covering the lupous surface with balsam of Peru plaster. Hypertrophic lupus heals more quickly when first curetted and then treated with cinnamic

acid in the pure powder or cinnamic glycerin injections. The treatment of lupus by this method he has found to require a considerable period of time, but the results are eventually good and very little shrinking or scar contracture takes place. He has found the following preparation to be very satisfactory:

℞. Ac. cinnamylici
Cocaini hydrochlor., āā 1.0 gm.
Spir. rectif. ad., 20.0 gm.

During the last few months Landerer has been using, instead of the emulsion, a 5 per cent. watery solution of sodium cinnamate for intravenous injection. The clinical results are as good if not better than those obtained with the emulsion. The solution can be sterilized in the water bath before using. He continues to use the emulsion in surgical tuberculosis.

Out of eighteen unselected cases of internal tuberculosis treated by Landerer[1] with cinnamic acid injections, 50 per cent. recovered, 33.3 per cent. were improved and 11.1 per cent. died. The results obtained with twenty-three earlier cases of the same sort treated with balsam of Peru showed 26.1 per cent. cured, 17.4 per cent. improved, 8.7 per cent. unimproved and 47.8 per cent. died.

A later report of fifty unselected cases of internal tuberculosis treated by cinnamic emulsion shows the following result:[2]

Cured 29 . . . . . 58 per cent.
Improved 10 . . . . . 20 per cent.
Unimproved 1 . . . . . 2 per cent.
Died 10 . . . . . 20 per cent.

Of the improved, four ceased to take the treatment and were lost sight of. Four cases presenting themselves with cavities in the lung are among the cured. Of the ten fatal cases, six were of the very acute and rapid type; the others were very advanced and, from the beginning, hopeless cases.

He has reported ten cases of coxitis cured. In one of these was a large abscess, which was treated as above.

[1] Die Verhandlung der Tuberculose mit Zimmtsäuer, Leipzig, Vogel, 1892.

[2] Deutsch med. Wochenschrift, No. 9 u. 10, 1893.

Two cases of spondylitis are reported. One is healed. The second, in which a large abscess had formed, became able to walk without pain, but at the time of report still had a fistula.

Nineteen cases of knee tuberculosis are reported, all cured but three, which were improved at the time of report. One of these had suppurated, but was eventually cured. Another of the cured cases presented for treatment a very much enlarged joint.

Nineteen other cases of tuberculosis of the lower extremity gave the following results: Seventeen cases, some with sequestra and abscesses, are cured. Two are still in process of treatment.

Three cases with sequestra from the head of the humerus were cured with movable joints.

A large number of cases of bone and joint tuberculosis with equally good results are reported. So with lupus and lymphatic tuberculosis. In all, the reports cover 107 surgical cases.

Landerer regards the action of cinnamic acid as resembling somewhat that of creasote and guaiacol. It differs from creasote in that the patients treated with the latter soon come to a standstill in their improvement, and after a certain time the drug seems to have no further effect. Only four of these cases of internal tuberculosis had not been tried with creasote. Notwithstanding the large doses of the drug the disease had continued; but after the cinnamic acid treatment was instituted gradual improvement was observed. The same is said of guaiacol. Iodoform has given Landerer no great satisfaction in the treatment of surgical cases. Cinnamic acid is at least as efficacious, and does not give rise to the fever and pain which follow injections of iodoform.

JAMES P. WARBASSE.

ZÖLLER ON THE SURGICAL TREATMENT OF HYPOSPADIAS AND EPISPADIAS IN THE MALE.[1]

IN the earlier times epispadias and hypospadias were treated only by palliative measures. When stenosis of the urethral opening

[1] Beiträge zur klinischen Chirurgie, XI Band, 1 Heft, 1894.

was present, it was treated with sounds or radiate incisions; and in cases of incontinence the patient was condemned to carry some receptacle for the dribbling urine. As surgical technique became perfected plastic operations for these defects were devised, and it is with these plastic operations that Zöller deals.

The operation of Dieffenbach[1] consisted in piercing the glans penis from its summit to the normal urethra, and allowing a canula to remain in this new opening till a lining of epithelium had formed. In the meantime the old urethral opening was closed. It was found that after this operation the new canal rapidly contracted, often becoming completely closed, so that sounds had to be passed very frequently to keep the lumen patent.

In higher grades of hypospadias the same indications must be met, and at the same time the organ must be restored as much as possible to its natural form. Here the conditions are much more complicated, and most surgeons incline to perform the operation in more than one stage.

Duplay[2] operated thus in three stages:

Stage I.—Median union of the freshened edges of the groove in the glans by interrupted and continuous sutures. When the groove is not deep enough, it is deepened by a median or two lateral incisions. To straighten the organ, when necessary, a transverse incision is made, and this then closed in the form of a cross or longitudinally.

Stage II.—For forming the urethra penis an incision is made on either side of the groove parallel to the median line, and met by a transverse incision at either end, thus marking out four quadrilateral flaps. The two inner are dissected up from without inwards, and the two outer from within outwards. These flaps must be so formed that the two inner are large enough to be united in the median line over a small sound in the urethral groove, and the two outer made to cover these. The two inner flaps are made as small as possible, and the two outer ones as large as possible.

[1] Dieffenbach, Operative Chirurg., Leipzig, 1845.

[2] Archiv gén. de med. Paris, 1874, Vol. I, p. 657; 1880, p. 257.

Stage III.—Uniting the newly-formed urethra with the hypospadic opening.

By this method Duplay was able to completely cure five cases.

J. Wood,[1] Gouley[2] and Michel[3] operated in much the same way, taking a skin flap from the under surface of the penis or from the scrotum, inverting it and fixing the edges to the borders of the urethral groove.

The methods of treating epispadias may be divided into two groups.

Group I.—Forming an urethra by uniting in the median line the freshened edges of the epispadic groove (Dieffenbach, Duplay, Krönlein).

Group II.—Plastic operations by means of flaps (Nélaton, Dolbeau, Thiersch).

Dieffenbach[4] succeeded in curing one case by means of the median suture. In another case he was not able to obtain anything like a satisfactory result.

Duplay operated, in three stages, very much as he did in hypospadias, except that he closed the canal by median suture of the edges. He obtained three good results: one case completely cured and two cases with fistulous openings,

Krönlein divided his operation into two stages: First, forming the urethra glandis after the method of Thiersch, and then closing in the urethra penis and the fistula by means of bringing together broadly freshened surfaces. He obtained a complete cure in a five-year-old boy.

The first operation for the cure of epispadias by means of flaps was undertaken hy Nélaton in 1852, and later by Dolbeau. A long quadrangular skin-flap, with its attached end just at the fistula, was taken from the belly, turned down so as to cover in the urethral

[1] Med. Times and Gaz., 1875, January 30.

[2] New York Med. Record, 1876, February 19.

[3] J. Courvoisier, Quelques considérations sur l'operation d. l'hyposp., Strassburg, 1869.

[4] Dieffenbach, Operat. Chirurg., Band 1, page 544.

groove, and sutured by its edges to a small flap running along on either side of the borders of the groove. Then two curved incisions, with their concavities upwards, were carried across the front of the scrotum. Between these a bridge of skin was dissected up, and the penis drawn beneath this bridge. In this manner the wound surface of the flap from the belly was opposed against the wound surface of the scrotal bridge. The edges of the wounds were then united by suture. A catheter was left in until union was firm.

Dolbeau operated upon three cases. The treatment lasted three months before a cure was effected, several operations being necessary.

Thiersch divided his method into five stages:

Stage I.—Establishment of a perineal urinary fistula to carry the urine away from the seat of operation.

Stage II.—Closing the groove in the glans penis. On either side of the groove a longitudinal incision is made converging at an acute angle toward the median line, and involving three-fourths of the thickness of the glans, so that the latter is divided into two lateral flaps and a median wedge. The outer borders of the groove are then freshened, and the two lateral flaps are drawn over the median wedge and sutured by their freshened borders.

Stage III.—Converting the penile groove into a canal. On either side of the channel a quadrilateral flap is dissected up in such a way that on one side the base or attachment is internally and on the other side the base is externally from the median line. The first flap is then turned over with its epidermis surface posteriorly; the second flap is carried over the first in such a manner that raw surface lies upon raw surface. These are held in place by interrupted sutures.

Stage IV.—For covering in the defect between the new urethra glandis and urethra penis the anterior half of the prepuce is employed. A fenestrum is cut through the whole thickness of the foreskin, the edges of the opening between the two canals are freshened, and then the glans is introduced through the fenestrum in the prepuce, and the edges of the separated layers of the prepuce are

fixed to the edges of the urethral opening. The divided edges of the posterior portion of the prepuce are then sutured.

Stage V.—Closing of the old meatus is accomplished by means of two skin flaps taken from the belly. One is a triangular flap with the base just above the opening. This is turned down and its edges sutured to the freshened edges of the opening. The other flap is taken from the lower anterior abdominal wall and turned down to cover the above, wound surface to wound surface.

Thiersch reckons on four months for accomplishing this operation.

The advantages of this method are very evident. Subsequent formation of fistulæ is prevented, because the suture lines do not lie one over another, but the deeper ones are covered by skin flaps which are sutured laterally. It has the advantage over the method of Dolbeau that the organ is restored to the most possibly normal form. Excellent results with this operation have been reported by Lücke,[1] T. Pick[2] and Gussenbauer.[3]

More recently Rosenberg[4] has devised a method by which, after covering in the groove, the penis is allowed to heal fast to the abdominal wall, in order to facilitate subsequent operation. Landerer practised the same, excepting that he made the scrotal skin to grow fast to the penis.

During the years from 1878 to 1892 inclusive, twenty cases were operated on in Professor Czerny's surgical clinic. The cases were as follows:

Hypospadias of the first degree	8
" " second "	4
" " third "	2
	14

[1] VI Kongress der Deut. Gesell. für Chirurg., p. 142.

[2] Lancet, 1870, Nov. 15, p. 726.

[3] Wiener Med. Wochenschr., 1886, No. 13, p. 467.

[4] Deutsche med. Wochenschr., 1891, p. 477.

[5] Deutsche Zeitschr. für Chirurgie, 1891.

Epispadias of the first degree	0
" " second "	4
" " third "	2
	6

The ages varied between twenty-two months and twenty-nine years. The anomaly was congenital in all cases excepting two, in which it followed the operation of ritual circumcision. In some cases the defect gave rise to no symptoms; in others it was associated with pronounced disturbances, such as retention and incontinence of urine and sexual impotence.

The methods employed in these cases are given below, the parenthetic figures standing for the number of after-operations included in the first number:

I. METHOD OF THIERSCH.

For forming the glans canal	10 (2)	operations.
" " " penile "	4 (2)	"
" the closing of fistulæ	7 (3)	"
	21 (7)	"

II. MEDIAN SUTURING OF THE FRESHENED BORDERS.

For forming the glans canal	6 (1)	operations.
" " " penile "	3 (2)	"
" the closing of fistulæ	12 (2)	"
	21 (5)	"

III. METHOD OF KRÖNLEIN.

For forming the glans canal	2 (1)	operations.
" the closing of a fistula	1	"
	3 (1)	"

IV. METHOD OF DUPLAY.

For straightening the organ	2	operations.
" forming the urinary canal	1 (1)	"
	3 (1)	"

V. METHOD OF DIEFFENBACH.

Perforatio glandis	1 operation.

In some cases somewhat modified procedures were employed. In one case, besides the median suturing of the edges of the glans

groove, the whole line was covered in with prepuce, and a good result obtained.

In two other cases the double Lembert suture was employed to close a fistula and an imperfect urethra. The skin about the fistula was dissected up like a collar, and flaps were loosened up along the sides of the groove. These borders were turned in and sutured, and then a second row of sutures was made to unite the peripheral tissues over this. Both results were imperfect.

The entire number of operations performed on these cases was fifty-two, of which number fifteen (29 per cent.) were after-operations. Treatment of minute fistulæ with pure hydrochloric acid or with the actual cautery is not included with these operations.

As suture material silver wire was first employed, but of late catgut and silkworm-gut has been largely used. Silver and silkworm-gut are least acted upon by the urine. Catgut serves best for buried sutures. With the exception of the cases in which a place for the escape of urine existed above the seat of operation, a permanent catheter was always introduced into the newly-covered canal. After the closure of fistulæ, it sufficed to have the patient urinate in a sitz bath.

The duration of treatment varied between one and five months, and in the cases which were cured three to four months were consumed.

The results of treatment are reported as follows:

Completely cured	7 cases.
Healed with incontinence	1 "
" " fistulæ	10 "
Without result	2 "

The percentage of cures (35 per cent.) would have been much greater had the patients who were discharged with fistulæ been subjected to still further operative treatment.

JAMES P. WARBASSE.

INDEX OF SURGICAL PROGRESS.

HEAD AND NECK.

I. The Symptoms and Treatment of Septic Infection of the Lateral Sinus. By W. ARBUTHNOT LANE, M.S. (London). The author, from a study of ten cases, arrives at the following conclusions:

(1) That septic infection of the lateral sinus is always due to the extension of an inflammatory process from an abscess between the bone and dura mater, through the wall of the sinus. Therefore, the symptoms which result from the infection of the blood in the sinus are preceded by, and are associated with, those due to the presence of a subdural abscess, or rather, to speak more accurately, an extradural abscess.

(2) The symptoms which a subdural abscess presents are dependent almost entirely on the fact of the dura mater being involved, and the chief indication of this condition is deep-seated pain and headache, radiating from the seat of inflammation. Therefore, it is impossible to determine in many cases whether one has to deal with a patch of inflamed dura mater, without the existence of an abscess, the inflammatory process having extended from the antrum to the dura mater in its immediate vicinity, or with a case in which the inflammation has been more intense, and pus has already formed. In either case the patient derives immediate relief from operative interference, and though in the former case the degree of inflammation in the dura mater may not be sufficiently intense to result in the formation of pus, yet one has no guarantee that it will not develop, and then, if not removed, it will very probably terminate the patient's life.

(3) A subdural abscess may cause death by producing a suppura-

tive arachnitis, or, by infecting the contents of the lateral sinus, it may produce death by pyæmia. The abscess may, however, discharge itself through the antrum, middle ear, and meatus, or through the cells, or through the mastoid bone by absorption of the superjacent bone, or through the opening for the mastoid vein. Still, this course should not be counted upon, and, even if it does take place, it is most advisable to perform antrectomy.

(4) In a large subdural abscess, besides the presence of the deep-seated pain and radiating unilateral headache, you may have a varying degree of inflammation of the arachnoid cavity, producing symptoms of arachnitis. These vary considerably in severity, probably in a direct relation to the area and intensity of the inflammation, and are represented by headache in the lower and back part of the head, retraction of head, etc. When the dura mater is much inflamed optic neuritis is usually present. The amount of deep pain and headache present in inflammation of the dura mater seems to bear a direct relation to the degree of the inflammation and the extent of the area of this membrane involved.

(5) Whether, in the case of a subdural abscess, the mastoid process be tender or painful on pressure depends entirely on its structure. If there be no mastoid cells, as is frequently the case, the mastoid process may be pressed on or manipulated forcibly without the patient experiencing any discomfort. Even when this symptom is absent, if the mastoid process be struck smartly with a pleximeter, deep-seated pain and tenderness is at once experienced.

(6) Whether a subdural abscess produces an infection of the contents of the lateral sinus or not depends to a great extent on the situation of the abscess. For instance, such an abscess in the posterior fossa may not overlie the sinus at all, or, on the other hand, its area may be very limited, so that its floor may be formed entirely by the outer wall of the sinus. A subdural abscess usually develops in a case of chronic purulent otitis, and complicates one of the many attacks of pain, etc., these patients suffer from. Rarely, however, it follows immediately upon a first attack of inflammation of the middle ear.

(7) The symptoms of septic infection of the lateral sinus develop upon, and are superadded to, those of subdural abscess. They consist solely of irregular, rapid fluctuations of temperature, very often amounting to a well-marked rigor, but not necessarily so. Of course, at a later period, other symptoms, due to the formation of secondary foci, etc., arise; but before these appear, apart from these fluctations in the temperature, there is no other symptom that I am aware of.

(8) For the development of secondary foci elsewhere, it does not seem necessary that throughout the whole course of the case there should be any naked-eye evidence of thrombosis. Inflammation of the wall of the sinus, intense enough to cause only an opacity of the intima, may be sufficient to produce, and can continue to produce, secondary foci, even after the subdural abscess, which originally determined the inflammation of the wall of the vein, has been thoroughly cleared out.

(9) Unfortunately, too often septic thrombosis of the lateral sinus escapes notice till too late; for, as in the more simple antecedent condition—subdural abscess—the surgeon frequently expects to find tenderness or swelling of the mastoid process, pain on percussion, pain or swelling in the position of the internal jugular vein, etc., none of which are necessary symptoms of this condition. It would seem usual that the less extensive the thrombus that develops, the more virulent are the clinical symptoms of septic infection, the thrombosis being apparently an effort on the part of the organism to lock up the intruding micro-organisms and destroy them. It occasionally happens that when there is obvious thrombosis of the lateral sinus, and clinical evidence of it as evidenced by the temperature, such thrombosis will cease to produce symptoms when the subdural abscess has been thoroughly evacuated by surgical interference, or spontaneously. In septic infection of the sinus, apparently without thrombosis, ligature of the internal jugular vein, after the subdural abscess has been evacuated, may stop the rigors only after the sinus has become thrombosed, but not till then.

(10) Again, ligature of the vein and sinus in a case of septic

infection, apparently without thrombosis, may not stop the progress of secondary foci, even though coagulation takes place in the sinus, owing to the extension of the septic process along the petrosal sinuses to the cavernous sinus.

(11) When extensive thrombosis exists, it does not seem necessary to remove the whole of the proximal and distal portions of the clot.

(12) The presence of secondary foci of septic infection does not preclude the possibility of recovery, provided the further supply of septic emboli be stopped.

(13) However advisable it may seem to ligature the internal jugular vein beyond the limit of the thrombus, and perhaps to remove its proximal part, there is no evidence to show that the complete removal of the distal portion of the clot is necessary, or that leaving it produced any effect that was prejudicial to the health of the patient.

(14) In spite of the variations in the activity and character of the conditions which result from septic infection of the lateral sinus, it would seem that the most scientific and most certain measure to adopt in every case is, after performing antrectomy, which is a necessary antecedent of every operation of this sort, ligaturing the internal jugular vein, and clearing out the extradural abscess, to remove as much as possible of the proximal portion of the clot, then the whole of the distal portion, or, if there be no thrombosis, to slit up the sinus beyond the limits of the abscess wall and plug it with gauze and iodoform.—The *British Medical Journal*, September 9, 1893.

GENITO-URINARY ORGANS.

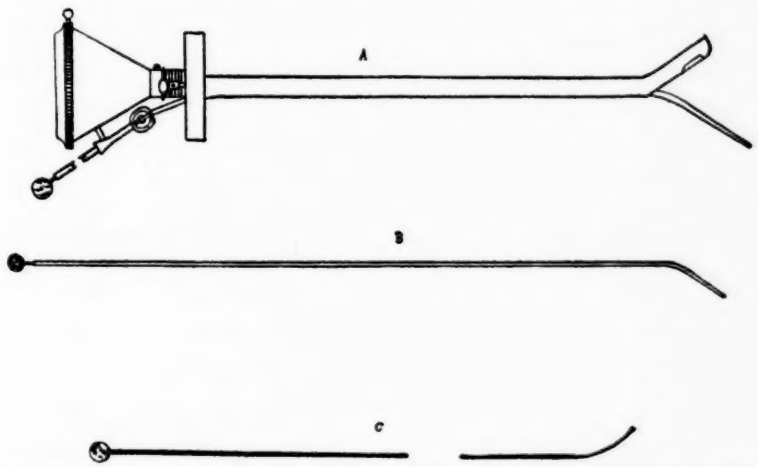
I. Catheterization of the Male Ureters. By JAMES BROWN (Baltimore). Though catheterization of the ureters for the purpose of determining the working capacity, or the existence of the opposite kidney, the cases in which nephrectomy for suppurative disease, or what not, is contemplated, has for some time past been successfully practised in the female, this procedure in the male has, up

to the present time, been attended with so much difficulty and uncertainty, not to say danger, that it is scarcely ever resorted to. The importance of ascertaining the functional capacity of the kidney to be left, in cases in which the removal of its fellow is contemplated, is self-evident, and the best means we could possibly possess of so doing would be to procure and submit to chemical and microscopical examination a sample of its secretion, unmixed with that of its fellow, is equally apparent. None of the methods heretofore devised for this purpose have proved satisfactory in the male, so that in reaching a conclusion respecting this important question prior to performing nephrectomy, we have been forced to rely on the characters of the urine as a whole, together with the other symptoms.

Though this is the first time, so far as we know, that the ureters in the male have been catheterized by the method which will be presently described, it is to Dr. Brenner, as will at once appear, the chief credit is due. In December, 1888, Dr. Brenner, of Vienna, devised a modification of the Nitze-Leiter cystoscope, the one that is used for examining the trigone and posterior wall of the bladder, whereby the fluid in the bladder could be changed without removing the cystoscope. It consisted of a small tube incorporated with the shaft of the instrument at its lower part. The tube is two millimetres in diameter. It terminates just below the window, and toward the eyepiece it is prolonged with a curve downward separately from the shaft for a distance of about four centimetres. Subsequently, by passing a fine catheter through this canula, Dr. Brenner attempted to catheterize the ureters. He succeeded in one female case, but failed in the male subject.

The instrument employed by Dr. Brown is essentially that of Dr. Brenner, the only modification consisting of a stylet terminating in a slight spring which, being introduced into the catheter, gives it a slight curve for a distance of about three centimeters at its tip. The method of procedure is as follows: The cystoscope having been passed into the bladder, which had best contain when possible 200 cubic centimetres of fluid, the stylet is withdrawn from the canula

and replaced by the catheter armed with its stylet. This is passed as far as the inner opening of the canula, but should not at this stage be carried farther. The ureteral orifice of the supposed sound side is now searched for, and when found the catheter is directed into it, the stylet having been withdrawn before it is pased beyond the inner opening of the canula. The curve given by the spring-stylet to the catheter enables the operator, by rotating the part projecting outside between the thumb and index-finger, to direct its point when free in the cavity of the bladder upward, downward, or to either side. If the



A. Brenner's modification of the Nitze-Leiter cystoscope, with catheter and stylet passed through the canula.

B. Catheter with stylet introduced; catheter 15½ inches in length.

C. Spring-stylet.

stylet is left in the catheter when not in use, it may be removed before passing the catheter into the canula, for the curve thus given its tip will be resumed as soon as it reaches the cavity of the bladder. The catheter is passed through the canula much more easily without than with the stylet. The point of the catheter soon becomes visible after leaving the canula at its inner orifice. The posture of the patient is important; the pelvis and thighs should be raised on an incline of about thirty-five degrees, the shoulders and head low. This throws

the abdominal viscera toward the thorax and thus prevents the respiratory movements from being communicated to the bladder; the ureteral orifices will also present more favorably in this than in the horizontal position. By this means Dr. Brown has successfully catheterized the ureters of two male subjects, and, it should be added, without the slightest difficulty in either case. Both suffered from double chronic pyelitis without any vesical involvement, as was clearly shown by the cystoscopic appearances of the mucous lining of the bladder. In the first case, which was catheterized on the 9th of June, 1893, no anæsthetic was used, as the man suffered from partial anæsthesia of the bladder and urethra, as well as of the lower extremities, due to the effects of an injury to the spinal cord received six years before; while in the second the only anæsthetic employed was two cubic centimetres of a 3 per cent. solution of cocaine injected into the deep urethra Both these cases were examined at the Johns Hopkins Hospital, and were witnessed by at least ten medical gentlemen connected with that institution. All of them stated that they could clearly see the catheter entering the ureteral orifice, and the ridge formed by it passing obliquely through the vesical walls was also plainly visible, the catheter being passed from eight to nine centimetres into the ureter. The manner in which the urine issued from the catheter was interesting to note—five, six or seven drops would come and then there would be a pause of several seconds duration, when several drops would again come in quick succession, to be followed by a pause as before. It seemed as if a certain amount of urine would collect in the ureter above the catheter, when by stimulating the muscular walls of this tube to contraction it would be forced out through the eye of the catheter, which being laterally placed about 1.5 centimetre from its tip, would be naturally occluded by the walls of the tube during the intervals of contraction.

How often we will be able to catheterize the ureters in the male subject by this means experience alone will determine. The conditions requisite for a satisfactory cystoscopic examination are of course essential, and any marked intravesical enlargement of the prostate is

an insuperable bar. In other words, the conditions most likely to interfere with its accomplishment are those in which it is least required, for, under these circumstances, the disease above, if any exist, is almost invariably bilateral, whereas in the early stage of primary disease of the upper urinary tract, the class of cases in which it will find its chief value, the obstacles are usually absent.

Besides the two cases above mentioned, the experience of the author embraces one other only. In this case he was not successful; no anæsthetic was used, and the mere presence of the cystoscopic tube in the urethra and bladder produced so much pain that he did not persist in the attempt. No attempt was afterwards made under anæsthesia, inasmuch as without it the diagnosis was sufficiently clear.

In the female this method promises, for obvious reasons, even better results than in the male. Its advantages over the method of Pawlik are, that it is done with the aid of sight, and by means of a soft pliable catheter instead of a hard metallic one.—*Johns Hopkins Hospital Bulletin*, September, 1893.

GYNÆCOLOGICAL.

I. Hysterectomy for Cancer of the Cervix by Combined Abdominal and Vaginal Dissection. By M. H. RICHARDSON, M.D. (Boston). The advantages of the vaginal hysterectomy lie chiefly in drainage.

By the suprapubic operation, in the Trendelenburg posture, one is able to determine the condition of the broad ligaments, to recognize a hopeless metastasis, and to dissect with precision. The slight dangers of this method are more than balanced by the thorough knowledge which may be obtained of the nature and extent of the disease. In cases evidently hopeless the abdomen can be closed and a palliative operation by the vagina substituted. But if, by abdominal exploration, no contra-indications to a complete hysterectomy are found, one may proceed with much greater safety, and more thoroughly remove the diseased uterus and appendages. From the pathological standpoint, therefore, the abdominal route is prefera-

ble, because not only the uterus and the cervix may be removed, but the broad ligaments and the structures contained within their folds can be included.

From the standpoint of the anatomist this operation is much preferable to the vaginal method. With the patient in the Trendelenburg position a clean dissection with the knife or scissors may be made as far as the vaginal attachment. Starting at the pelvic brim, the structures may be successfully tied and cut until the cervix is approached, when by careful manipulations the ureter may be brought into view. The dissection from this point may be carried on as intelligently as a dissection of the common carotid. The ureters on either side may be brought into view, held out of the way by an assistant, and the vaginal attachment severed. The uterine arteries can be found by their pulsation, and tied, As the vaginal attachment is approached, however, it is very hard to tell just the limits of the disease. Up to this point the operation may be performed with great ease and with perfect safety. Separation of the vaginal attachments on all sides must now be made with great care if one would avoid wounding the rectum, the bladder and the ureters. During the prolonged manipulations necessary to avoid these errors, a considerable risk of a serious septic infection is run. It is to avoid these difficulties and dangers that the combined vaginal and abdominal dissection is advocated.

By the combined abdominal and vaginal operation the uterus may be delivered either through the abdomen or through the vagina. It makes little difference, however, which way is selected, because, having separated carefully the cervical attachments of the vagina below, the completion of the operation by the abdominal route is rapid, and the peritoneum runs little if any more danger of infection than by the vaginal route alone.

The method advocated as the safest and most rational procedure for the radical excision of uterine cancer is first to separate by clean incision the diseased cervix from the vaginal mucous membrane by as broad a margin as possible without wounding the rectum, bladder or

ureters. The incision should be carried through the mucous membrane until the areolar tissue is reached; then dissection should be carried on by the finger or by some blunt instrument until the peritoneum is reached, care being taken not to open the peritoneal cavity. It is, of course, necessary previously to have disinfected as far as possible the cancerous ulcerations. The hands should now be thoroughly sterilized, and the abdominal incision made with a second set of instruments. Having separated the broad ligaments and isolated the ureters, the vaginal with the abdominal incision may be rapidly connected. The uterus may be delivered through the vagina or through the abdominal wound. If the mass is too large easily to be delivered by the vagina, the abdominal route should be chosen; not that it makes any great difference where the exposure is so brief, especially if the intestines, in the Trendelenburg position, are abundantly protected by sterile gauze. After removal of the uterus the folds of the peritoneum may be united by continuous suture, or a gauze drain may be provided through the vagina.

In clean hysterectomies a continuous suture should be applied; in septic operations a free dependent drainage should be provided by leaving a gauze drain in the vagina.

The prognosis as to recurrence in even the most radical operation upon a cancerous cervix is bad; for, under the most favorable circumstances, the margin of healthy tissues seems utterly inadequate. A small cancerous nodule in the centre of a large breast demands excision of the whole organ, and even then recurrence is the rule. An infiltrating epithelioma of the lip requires in its proper removal the broadest possible margin of healthy tissue; and if that margin is a close one we look upon recurrence as almost certain.

In uterine cancer, therefore, the prognosis is necessarily bad if there is any extra-cervical infiltration whatever; and while under these circumstances hysterectomy is justifiable, its performance cannot be strongly urged. If the vaginal disease is extensive only local palliative operations, performed extra-peritoneally, are justifiable.—*Boston Medical and Surgical Journal,* November 2, 1893.

REVIEWS OF BOOKS.

ESSENTIAL OF MINOR SURGERY, BANDAGING AND VENEREAL DISEASES. Prepared especially for Students of Medicine. By EDWARD MARTIN, A.M., M.D. Second edition. Philadelphia: W. B. Saunders, 1893.

DISEASES OF THE EYE, EAR, THROAT AND NOSE. A Manual for Students and Practitioners. By FRANK E. MILLER, M.D.; JAMES P. MCEVOY, M.D., and JOHN E. WEEKS, M.D. The Students' Quiz Series. Philadelphia: Lea Brothers & Co., 1892.

ESSENTIALS OF BACTERIOLOGY. For the use of Students and Practitioners. By M. V. BALL, M.D. Second edition. Philadelphia: W. B. Saunders, 1893.

In connection with other works of this class, the ANNALS OF SURGERY has put upon record its belief that there is a special field for them. In the elaboration of the study of medicine, consequent upon the advances in knowledge and the extension of specialism, the use of these aids to the consideration of the more exhaustive text-books upon the subjects of which they treat, has become practically a necessity.

The works before us are excellent examples of the best type of question books. The portion of Dr. Martin's book in which minor surgery is considered, is particularly full, well stated and clearly illustrated. The salient points of bacteriology are distinctly and concisely brought out by Dr. Ball, while Drs. Miller, McEvoy and Weeks have presented notably comprehensive *précis* of their subjects.

JAMES E. PILCHER.

THE SURGICAL TREATMENT OF PULMONARY CAVITIES.[1]

By N. PENDLETON DANDRIDGE, M.D.,

OF CINCINNATI,

PROFESSOR OF SURGERY IN MIAMI MEDICAL COLLEGE.

THE surgical treatment of pulmonary cavities, with its proper limits and restrictions, is well worth serious discussion and careful consideration at this time; for, on the one hand, there is an undoubted tendency on the part of some to boldly push its application beyond the just limits of reason and safety; and, on the other hand, there is a hesitancy to admit its application to those cases where it has already been shown that it may be properly applied, and where experience has demonstrated that we possess no other adequate means of combating conditions which tend to a necessarily fatal termination.

A large number of experiments upon animals has unquestionably shown that considerable portions of the lung may be removed without serious impairment to health, and that the lung may be punctured with comparative safety, and that for this purpose local obliteration of the pleural sac may be induced by artificial means. These experiments have undoubtedly been of great service in establishing the possible extent of operative interference in man, and have determined many important steps in the methods and technique of these operations. Their comparative safety in animals and the possibility of avoiding fatal consequences by proper care and experience has, however, often led to conclusions beyond the limits of just deduction, and have justified operative interference beyond the proper bounds of prudence. Simply because a patient survives some operative inter-

[1] Read before the New York State Medical Association, October 10, 1893.

ference by no means proves that he is ultimately the better for it, or that the same end might not be better and more safely, even if more slowly, attained by other less hazardous means. The experimental work on animals, which has done so much for this department of surgery, has so often been fully described that it is not necessary to recall it in detail, except to offer the suggestion that here, as elsewhere, the work of the laboratory has proved a very insufficient basis for the actual work of the surgeon.

Peyrot, in his recent work on surgery, divides pulmonary lesions, in their relation to surgical interference, into two classes: (1) Limited or localized lesions, in which he includes gangrene of the lung, most abscesses and hydatid cyst; (2) diffused lesions, pulmonary cavities and bronchiectasis. This division is of practical importance for the purpose of this paper, for the complete removal of a limited lesion, if possible, relieves the patient of his trouble, and, if he does not succumb to the operative attack, restores him more or less fully to health; on the other hand, the removal of a local lesion in a generalized or diffused disease must of necessity be incomplete, and leave the general pathological state unchanged. Evident as this is, and of great importance to bear in mind the very subject we are considering, too much stress must not be laid upon it, for we are constantly confronted with cases where the influence of a local pathological lesion dominates the general state, and becomes the controlling factor in the dangerous conditions present. This is notably true in regard to tubercular cavities in the lung. The presence of foul decomposing secretions in these cavities give rise to a series of profound septic conditions, which materially aid in developing the general disease, while, by causing frequently recurring attacks of distressing cough, weaken the patient by loss of sleep and strength, and so materially diminish his resistance to the influence of the general tubercular trouble. Furthermore, the discharge of the foul-smelling secretions by the mouth often nauseates, and so diminishes the little capacity there is for taking the necessary food. This unfortunate circle of influences is due to the fact that there exists a focus of pent-up

secretions under conditions most favorable for putrefaction, and where the conditions are most unfavorable for disinfection, or the thorough removal of the materies morbi. If, now, surgical interference can remove or modify this local trouble, which is the direct cause of such serious consequences, and can so modify for the better the general condition of the patient, even if it does not control the other phases of the disease, it is not only justifiable, but strongly indicated. This course, indeed, is constantly pursued in other portions of the body, where operations are performed simply for the relief of suppurative processes which are sapping the strength of the patient. What surgeon would hesitate to drain or scrape out tuberculous abscesses in other parts of the body, which were accessible to interference, because there happened to be evidence of commencing disease in the lungs or tubercular foci elsewhere. The presence of such new and extending processes of disease call with increasing force for the removal of the source of septic infection. What applies to tubercular cavities applies also, but possibly with less force, to bronchiectatic cavities, for here we find much less frequently a single cavity so far in advance of the dilatation more or less diffused, as to be the evident cause of the septic state from its retained secretions.

As to the efficiency of operative measures in these cases, Powell, in the last edition of his work, bears strong testimony. In speaking of a case in which a bronchiectatic cavity had been opened and drained, he says: "I was much struck at the extraordinary effect draining of the cavity had upon the cough and expectoration. The amount of expectoration was reduced from 16 to 20 ounces a day to almost nothing."

Because the conditions favorable to operation are not present in the majority of cases of bronchiectasis, or because they are rarely found, is no reason for withholding the operation when a favorable opportunity does occur. The results which have thus far been attained by surgical interference in pulmonary cavities, have been to provide free drainage and disinfection of cavities and abscesses, and the removal of gangrenous masses and foreign bodies.

The propriety of operative interference depends, therefore, upon the possibility of accomplishing these aims, and upon the danger of the operation, and, further, upon the presence of a septic condition dependent upon the local cavity or lesion, and, finally, as to whether other forms of treatment have been satisfactory and successful. This last element in the problem may, I think, be readily disposed of. "All attempts," says Shurley, "to modify or disinfect lung cavities by injection or disinfection, have proved in the vast majority of cases ineffectual." That foul and decomposing secretions found in pulmonary cavities are, in themselves, most hurtful, and modify most unfavorably all forms of chronic lung disease, is so universally admitted that it is not necessary to prove it by specific authority.

In the following paper I shall confine myself to the opening and draining of pulmonary cavities, and pass without further consideration those daring attempts, based largely upon experiments in animals and false pathological analogies, in which portions of consolidated lung have been removed. Tuffier, indeed, has reported a case where a solid apex was successfully removed from a man of twenty-five, and Watson, more recently, another, where an infiltrated mass as large as a fist was taken away by an operation most ingeniously conceived. In spite of such isolated success, the time has certainly not yet come when the words of one of our most advanced surgeons, words spoken, indeed, before the State Society of this very State, eight years ago, can be said to have become prophetic, when, in speaking of Bloch's case of pneumonectomy of tubercular disease, he said: "While I would not say that we are just yet prepared for this sort of thing, I would not be surprised at its attempt by some venturesome spirit, nor condemn it, and I look forward to the time, perhaps just before the millennium, diagnosis and technique having in the meantime been perfected, when excision of the tuberculous apex may be the recognized treatment." Peyrot, in his recent work, condemns these operations most strongly: "I would say, most willingly, with Koenig, that to practice these operations one must ignore all the acquired knowledge of pathology, and that we ought to protest against such wholly unjustifiable attempts."

The various forms of pulmonary cavities which come under the care of the surgeon for operative interference, may be enumerated: (1) Abscess of the lung, pulmonary gangrene and hydatid cyst; (2) tuberculous cavities, bronchiectatic cavities and pyopneumothorax. The second class presents much the largest number of cases in which the question of operation will have to be considered, and here also we find the greatest difference of opinion as to the propriety and efficiency of surgical interference.

Turning now to the treatment of tubercular cavities, it will be of interest and profit to know what some of the recent systematic writers, who view the matter from a medical standpoint, have to say upon this subject. Douglas Powell says: "That surgical treatment in phthisical cavities offers little prospect of advantage, because, first, cavities are usually situated at the apex, and their drainage per vias naturales, by the bronchia, is fairly maintained, so that interference is not often called for. Secondly, cavities are not often single with any activity of symptoms; and, third, excavation in phthisis is a conservative process so far as it results in removal of morbid materials, that are far more injurious than vacuity. Half the history of phthisis is made up of this elimination process, with which the hectic phenomena are identified, and with the accomplishment of which they cease, if the perfected elimination be not overlapped by activity of process in other centres. Hence, pulmonary surgery, in regard to phthisis, has not, I fear, a hopeful future." "But," he continues, "cases now and again present themselves in which the extent of the excavation, superficialness of cavity, restriction of disease to one side and a large amount of secretion, strongly suggest external drainage." This is a very concise statement of the case, and one which fairly offers encouragement for the surgeon in properly selected cases.

Exaggerated claims for operative interference are to be most strongly deprecated; but in a certain number of cases, as practically admitted above, the conditions are such that operation for the purpose of external drainage is justified and demanded. Burney Yeo writes in much the same strain: "It is doubtful if

ordinary phthisical cavities will ever admit of successful surgical interference, either by drainage, injection or aspiration. It is exceedingly rare in phthisis to find a single cavity without adjacent lesion, and most commonly there is an extensive surrounding pulmonary disorganization, so that whatever alleviation of particular symptoms (profuse or fœtid exudation, for example) might occur, it could only be temporary." Shurley, who has such undoubted confidence in the form of treatment in phthisis introduced by himself and Gibbes, has recently reported two cases of advanced disease, in which pulmonary cavities were treated by incision and the inflation of the cavity with chlorine gas, and, while neither of these cases proved successful, he advocates further efforts in this direction, to secure free drainage and to bring into contact with the tubercular tissue of the walls this agent, in whose destructive action upon the bacillus tuberculosis he has so much confidence.

In this connection I desire to report the following personal experience:

B. S., aged twenty-nine, well developed and fairly nourished, entered the Cincinnati Hospital September, 1892. His father died of phthisis, and most of his relatives have died of the same disease. He has had the ordinary diseases of childhood, and in addition gonorrhœa and pneumonia, but denies syphilis; he admits free drinking. Patient says he had rheumatism all of last year, and last March he was in the hospital with symptoms of chronic inflammation extending along the entire ascending colon, and since then he has always been sick. Patient came to the house complaining of severe pain on the right side upon inspiration, with dyspnœa and a continued dry cough. Appetite good, bowels regular, and tongue normal, pulse 108, temperature 99.4 degrees. Physical examination showed some diminution of expansion on the right side of chest. Palpation negative. On percussion there was dullness on the right side, as high as the seventh rib in front and to the angle of the scapula behind, and diminished resonance at the apex. Auscultation negative on the left side; there is a roughened and prolonged expiration upon the right side, at the apex, and tubular breathing anteriorly, at the seventh rib, and weak, moist, nearly inaudible sounds below.

Soon after admission, Dr. Oliver, then on duty in my absence,

introduced a hypodermic and drew off some bloody fluid, which, on microscopic examination, failed to reveal any pus corpuscles, and on this score he expressed a doubt as to the presence of empyema, which had been asserted, and gave his opinion that a cavity of the lung existed. The general condition of the patient was such as to keep him constantly in bed for several weeks after his admission; the local condition remained unchanged. He was then submitted to operation, and three inches of the eighth and ninth ribs were removed in the axillary line, and the underlying cavity freely opened, and about half-a-pint of blood-stained purulent fluid mixed with the débris of broken-down tissue and caseous material evacuated. Over this cavity the pleural surfaces were firmly adherent and the cavity reached to the surface of the lung. The walls of this cavity were rough and irregular, as in ordinary phthisical cavities, and a large portion of the lower lobe was excavated. The cavity was washed out with a sterilized boracic solution, the skin incision partly closed, and a double drainage-tube left in place. The discharge at first was very free, but soon diminished, and the drainage-tube was abandoned after some days, and the incision readily healed. The general condition at once improved, and the man was soon up and about the house. The area of dullness diminished, but did not entirely disappear, and the respiratory sounds could be heard at a much lower level than before. The condition of the right apex remained unchanged. This man left the hospital in about two months, and since then nothing has been heard from him.

This case presents the type of lung cavities most accessible and most favorable for operation—obliteration of the pleura over a superficial basic cavity of considerable size, in a patient not too much debilitated, and whose general nourishment has not already suffered. In such cases the operation presents no difficulty and but little danger, and few if any would hesitate to recommend it. It is unfortunate that the case could not have been kept under observation sufficiently long to determine the course of the disease in the right apex. In cavities at the apex of the lung the operation is necessarily more difficult from the relation of the parts, but even here Poirier finds that it is easy of performance, and secures very efficient drainage. Their situation offers the condition favorable for freer drainage by the bronchi, so that

there is less likelihood of secretion being retained and undergoing putrefaction. Still, this condition does occur, and where sufficiently prominent the operation should be undertaken, and there is good prospect of benefit and even of cure. Poirier and Jonnesco, in their report to the Congress for Tuberculosis, Paris, 1891, report that twenty-nine operations in cavities of the apex gave four cures, fifteen were benefited, nine without results and one unknown. A study of the general statistics of the operations on lung cavities of both apex and base present curious contrast.

Hofmokl reports twenty-four cases with five cures, five unimproved, nine deaths and three unknown. Lopez, thirteen cases, thirteen deaths. Slawitz, thirteen cases and three cures. Seitz, eleven cases and five cures.

Such results are certainly not without encouragement when the benefits of diverting the foul discharges are remembered even if a cure does not result, and contains in itself a refutation of the condemnation which has been expressed against surgical interference in tubercular cavities. The objection which has been urged against operation in bronchiectasis—that the dilatation is never confined to a single portion of the bronchial tube is certainly true of the majority of cases, but it is also certainly true that at times we meet with single cavities from this cause, so much larger and so far in advance of all others that they can be readily located, and which undoubtedly furnish the great mass of the putrid expectoration from which the patient suffers. In such cases Powell speaks in hopeful and approving manner of operative measures. I have quoted him above as to the benefit to be expected by marked diminution of the quantity of expectoration. He further adds: "When the area of disease is definable and the patient's health is becoming undermined in spite of all the resources of medicinal and climatic treatment, operative measures may be devised, and I believe good may be effected, although the cavity or area of excavation be not thoroughly drained, by setting up contractile changes in the tract of the tube," and this favorable opinion he considers supported by actual statistics of the operations thus far reported. Findley reports five cures and fifteen deaths in twenty cases. Lopez, four cures and eight deaths

in twelve cases. Hofmokl, no cures, eight deaths, one unimproved and three unknown in twelve cases. The average operation in bronchiectatic cavities is likely to be much more difficult and dangerous than in a like number of tubercular cavities, for the latter are much more apt to be superficial with adherent pleura, so that the danger of cutting through lung tissue will be avoided. Still, both Burney Yeo and Powell speak with approval of surgical interference in appropriate cases.

In cases of abscess, gangrene and hydatid cyst of the lung there seems to be a growing unanimity of both medical and surgical opinion that an attempt to drain and evacuate these cavities ought to be made. Abscess of the lung may occur as the result of septic emboli, when they are likely to be small and scattered throughout the organ. These do not fall within the range of operation. "Abscess formation is frequent in the aspiration forms of pneumonia. They vary in size from a walnut to an orange, and have ragged and irregular walls and purulent, sometimes necrotic contents" (Osler).

Foreign bodies may cause abscess by penetrating the wall or by being drawn in through the trachea. In most, if not all, the cases reported from the latter cause the foreign body has been accidentally discovered when the abscess was opened; finally abscess may break into the lung from neighboring organs. In individual cases the question of operation would depend simply upon the possibility of diagnosis and the definite location of the abscess, for all admit the extreme gravity of this condition when left to nature. Huber has advised against the attempt during the existence of an acute pneumonia, and this has been the course in the majority of cases reported. Lopez has reported fourteen cases of abscess of the lung submitted to operation, with twelve cures, one death and one case the result unknown. Hofmokl, forty-two cases, fourteen complete cures, three with fistula, twenty-four deaths and one unknown. The question of how far the operation was responsible for the fatal cases cannot be determined from these statistics. Spontaneous evacuation through the chest wall sometimes occurs, but the drainage in these cases is seldom sufficiently free to insure a perfect cure, and fistulous

tracks often remain open, and finally determine a fatal result. The following case bears upon this point:

Case of Pyopneumothorax with a Bronchial Fistula Relieved by Resection of Rib and Opening and Draining of Cavity.—In March, 1891, I was called to see the patient by a friend, who was temporarily in charge during the absence of the regular physician. The condition I found was as follows: There was an opening between the seventh and eighth ribs on the left side in the axillary line, from which a foul-smelling discharge escaped, and through which air was forced with jets of putrid matter during the fits of coughing, which occurred at short intervals. Large quantities of purulent matter were expectorated from time to time. A probe was found to pass readily through the fistula, upwards and inwards, and at the depth of three inches entered a cavity of apparently considerable size. The connection of this cavity with a bronchial tube of large calibre was unmistakably demonstrated by the manner in which air and pus were forced through the external opening during the spells of coughing. A carbolic solution, which was used to wash out the cavity, was immediately tasted after being introduced, and always provoked coughing, with expectoration of a quantity of matter smelling of carbolic. The heart was somewhat displaced to the right, and the upper part of the left side anteriorly was depressed. The respiratory sounds could be heard over the upper part of the lung in front and throughout the back. The right lung appeared normal. It was evident that the cavity on the left side contained a quantity of foul, decomposing pus, for which there was a very inadequate escape either through the bronchus or by means of the external fistula. The symptoms all indicated a profound septic condition. Severe and distressing chills occurred at short intervals, with high temperature and exhausting coughing spells, and for some days when first seen the man had been growing rapidly and progressively worse. The early history of this case, which it was possible to obtain, is somewhat meagre.

In January, 1890, more than a year previous, the patient had suffered from an attack of pneumonia, from which there was consolidation of nearly the whole left side. In March an abscess pointed and was opened on the anterior aspect of the chest, and proved to be connected with the interior of the thorax. His physician at that time was uncertain as to whether this was due to an abscess of the lung or an empyema. There was no pneumothorax at this time, and

the date when this occurred could not be definitely determined. The man's condition when I saw him was such that it was evident death must soon ensue unless he could be promptly relieved of the constant absorption from the putrid pus in the badly-drained cavity. It was determined, therefore, to freely expose and empty this cavity and attempt its thorough disinfection. A large section of the sixth, seventh and eighth ribs was removed through the antero-lateral aspect of the chest. The pleural cavity was obliterated and the pleura greatly thickened. The fistulous track was traced upwards and inwards with a large grooved director, and with this as a guide a large cavity was laid open with the thermo-cautery. The cavity was of large size and contained an amount of decomposed pus. The tissues covering it, which were cut through with the cautery knife, were of a dense fibrous structure and had lost all characteristics of lung tissue. This was freely destroyed by the cautery, and the cavity was irrigated and a large-sized drainage tube left in place. The improvement began at once, the septic condition disappeared and in a few weeks the man was able to be out, and was soon restored to comparative health. The fistulous opening in the side has, however, never completely closed, but all evidence of connection with the bronchial tube quickly disappeared, and if the patient had permitted the proper means to be continued in order to secure sufficient drainage, a definite cure might have resulted. He was, however, irascible and unreasonable, and would not tolerate the presence of a drainage tube. As it is, however, he has enjoyed nearly two years of comparative health and comfort. He is now, I understand, beginning to show amyloid degeneration of some of the inner organs. Whether or not in this case there was originally an abscess of the lung there may be, possibly, some doubt. Certainly at the time of the operation a considerable cavity was found within the limits of the lung, from which there was free communication with a bronchus of large size.

In these cases of bronchial fistula free removal of ribs will probably always be necessary, and the fistulous track should then be freely laid open until the cavity is reached, and for this purpose the thermo-cautery is certainly the best instrument. In this way a cavity, if it exists, can be more certainly drained, and if none exists, any irregularity in the fistulous track itself, which may prevent the ready escape of the discharges, be removed.

In local gangrene operation affords the only practical chance, and, when the disease can be located, the cavity should be opened freely enough to permit the removal of the gangrenous mass. The suggestion made by Delageniere, that the entire section affected should be exsected, is not to be approved of, although he claims that in these cases "failure is due to the fact that gangrenous foci have only been opened and drained, and thus all the gangrenous tissue has not been fully removed."

Of the result in gangrenous cases, Lopez reports seventeen cases of gangrene treated by opening the cavity, followed by ten cures, six deaths and one case unknown. Hofmokl, twenty-four cases, five cures, one unimproved, thirteen deaths, two unknown.

Hydatid cysts give the larger number of cures where pneumotomy has been done, and the greatest percentage of recoveries. It has become a recognized procedure among the English surgeons of Australia, both before and after suppuration has occurred. Hofmokl and Lopez give, respectively, forty-five cases with thirty-seven cures, and thirty-six cases and thirty-one cures, certainly a most gratifying result."

The operation of pneumotomy may be extremely simple or may involve very great difficulty. The difficulties depend upon whether adhesions have closed the pleural cavity where the opening is to be made, and the depth in the lung at which the cavity is situated. If situated any distance beneath the surface it may be easily missed by the knife or trochar, and the necessity for cutting through normal lung tissue certainly exposes to the risk of hæmorrhage and increases the danger of infection. It is of importance, then, to determine in all cases whether adhesions of the pleural surface have taken place or not. The introduction of the sterilized needle through the chest wall is said to indicate this with certainty. If adhesions have not taken place, movement of the pleural surfaces upon one another will be indicated by free movement of the free end of the needle. The value of this method is accepted by a number of writers upon this subject. It may be a question as to whether partial consolidation of the lung might not so limit the pleural movement as to render it inoperative. The size and depth of the cavity it is of

importance to determine if possible. Godlee says that the amount of discharge by the mouth is no indication at all of the size of the cavity. He has known cases where a pint was daily expectorated in which the cavity would not contain an ounce. Shurley has emphasized the difficulty of determining with certainty the location of cavities and the distinguishing of pulmonary excavations from locular collections in the pleural cavity, or of distinguishing bronchiectatic cavities from others. "I believe," he says, "it well nigh impossible with certainty to determine the perspective, so to speak, of a pulmonary cavity; that is, whether it be half an inch, or two or three inches, from the surface, with or without much intervening pulmonary parenchyma." Before any operation is undertaken the existence of a cavity should certainly be ascertained by the introduction of a large-sized aspirator needle, and its depth determined, so far as the uncertain thickness of the thoracic wall will allow. And, at the time of the operation, puncture should again be made, after the costal pleura has been exposed. The lung may thus be punctured safely in various directions, a number of times, until the cavity is reached and its depth accurately determined. The canula held in place is a ready guide for the cautery or knife. It has, indeed, been suggested to have the canula grooved in order to facilitate its use for this purpose. The opening of cavities at the apex is more difficult, and from the relation of the parts, likely to be more dangerous than in the base. Poirier and Jonnesco have minutely described the steps of this operation, and their description is worthy of being followed. The first intercostal space has an average breadth of two centimetres. The incision commences in the middle of the sternum, four centimetres, the thickness of two fingers, below the supra-sternal notch, and follows the interspace nine centimetres. This incision is made with the thermo-cautery, and includes the skin and subcutaneous tissues. The fibres of the pectoralis major, which are seen, are separated by a grooved director. At the outer angle of this wound the anterior thoracic artery and vein may be seen, and at the inner, the internal mammary vessels, a centimetre from the edge of the sternum. The space between is six centimetres. The intercostal pleura is laid bare by a careful incision

of the intercostal muscle. The presence of adhesions of the pleural surface can now be readily determined. If they are not present the transparency of the pleura allows the movement of the underlying lung to be seen. If present the pleura appears thickened, resistant and of a dull white color, and conceals the lung surface underneath. Any uncertainty, however, can be removed by the introduction of a needle, and observing whether movement occurs in the free end. If adhesions are present, the cautery knife is used and made to penetrate the tissues in a direction slightly upwards and backwards. The cavity should be freely opened, and it is often necessary, in order to reach it, to pass through some thickness of tissue which is studded with tubercle. If adhesions are not present the perforation of the lung is postponed for several days. Resection of the rib is deemed generally unnecessary. There is decided advantage in commencing the incision in the middle of the sternum, for this permits of free separation of the edges of the wound and so gives greater space for the deeper manipulations. In order to approach the lung from behind, the incision commences from the seventh cervical spine, and extends to the internal superior angle of the scapula, passing through the skin and trapezius. The fibres of the rhomboideus are separated and the posterior third of the second rib is exposed. Four centimetres of this are removed and the pleura laid bare. This latter operation is reserved for exceptional cases, and I have not been able to find any report where it has been done in actual practice. The operation thus described should be practiced in cavities at the apex, except that the knife may be well used instead of the cautery in the superficial incision, and the section of rib may be made if found necessary to secure sufficient room. The scapular region must be for the present considered beyond the reach of surgical interference. Whether it will remain so time alone will tell. For the rest of the lung, especial care should be exercised to see that the puncture falls at the point where the symptoms of cavity are the most pronounced, and of the greatest intensity. Otherwise, the cavity may be entirely missed. A preliminary puncture should always precede operative interference. The incision through the

thoracic wall should be made with care until the parietal pleura is reached and the question of adhesions determined. Resection of ribs is usually advisable, and a sufficient number should always be removed to permit of free opening and full exploration of the cavity with the finger.

Most writers object to the washing out of the cavities with any kind of fluid, and advise their being packed with dry gauze. In this I think they have gone too far. A gentle stream of water, if free escape is allowed, would seem to be the safest and readiest method of removing secretions, often tenacious, and the débris of dead tissue, with the caseous masses, which are not infrequently found. Distention of the cavity must be most carefully avoided. I must deprecate mopping or swabbing the walls with dry gauze, however gently it is done, as liable to produce bleeding, and open the door to infection. Bleeding may occur from two sources: First, the walls of the cavity, and, second, the overlying tissue cut through by the knife. Spurting vessels should, of course, be seized, if possible, and tied. In the bottom of the cavity with friable walls, this will not, however, often succeed. Packing with simple or iodoform gauze is usually successful. The best preventive for bleeding along the incision is the use of the cautery in puncturing the cavity. This track may be enlarged, if necessary, by the same agent, or by the use of forceps, which are introduced closed, and subsequently opened. The knife should not be used to open the pleura, or penetrate the cavity, unless the latter is very superficial, and the former most certainly obliterated. If the pleural surfaces are not united, the opening of the lung should be, if possible, delayed. Adhesions may be induced by simply packing the wound with gauze, or by sewing the lung to the thoracic wall. Godlee, as far back as 1888, showed that the latter was feasible, but very difficult. It has been done, but how often successfully it is impossible to say. Cases have been reported in which an empyema has promptly resulted after opening the lung where the pleura had been stitched together. Immediate opening in these cases should be avoided if possible, as this method of attaching the surface is by no means a satisfactory and safe barrier against the escape of the

contents of the cavity into the pleura. In cases of pyopneumothorax, if the track through the lung can be traced, this should be enlarged with the cautery, using a grooved director as a guide. In this way any cavity or dilatation may be exposed, and irregularities of the track destroyed. The depth to which it will be safe to follow up these tracks time alone can tell. Treated in this manner there is a reasonable expectation that any communication with a bronchus will be permanently closed. The method adopted in one case, with bronchial fistula, by Guermonprez, is not to be commended. The opening in the pulmonary pleura was found after an excision of a number of ribs, and was then closed, and a slow convalescence ensued. Such a procedure would not be without danger, and would probably result in the retention of secretions, and a probable subsequent opening of the fistulous track. We may quote here with approval the suggestion of Thompson, of Manchester. In cases of empyema he advises the removal of ribs, and, after the escape of the pus, he explores the surface of the lung, and if any irregular indurated spots are found on the surface, he lays them open with the thermo-cautery. In this way tubercular foci, or superficial abscesses may be dealt with.

Conclusions.

The above study justifies the following conclusions:

(1) A certain number of lung cavities can be successfully dealt with by incision and drainage.

(2) Tubercular cavities in the lower portion of the lungs—if single and superficial, and the general condition of the patient permits—should always be opened. Cavities at the apex should only be opened where free and persistent fœtid expectoration is present, and has resisted treatment, and the rest of the lung is not involved.

(3) Abscess, gangrene and hydatid cyst should be opened and drained whenever they can be located.

(4) Closure of the pleura should be present before evacuation of a cavity is attempted.

(5) In cases of pyopneumothorax the fistulous track

should be explored, and any cavity freely laid open by the cautery.

(6) Cavities that have been opened are best treated by packing with gauze preferably iodoform.

(7) The further careful trial of such agents as iodoform, chlorine gas, and chloride of zinc, is desirable to determine as to whether the tubercular infiltration may not be modified by them.

(8) It is very desirable, for the further extension of surgical interference in pulmonary cavities, that the means of locating such cavities, and of determining their size, and the exact character of the tissue that overlies them, should be perfected by further study, and for the accomplishment of this the surgeon must look to the physician.

OBSERVATIONS UPON APPENDICITIS.

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Acute Appendicitis. Clinical History.

IN the great majority of cases the clinical course of the disease is characterized at the outset by the occurrence of acute abdominal pain. While the term "appendicular colic" (Talamon) has been given to this acute pain, I consider this misleading, and liable to give rise to indifference on the part of the medical attendant to the true conditions present, and the dangers which threaten the patient. The term "colic" has been generally applied to purely functional disturbances of the large and small intestines; the acute pains of appendicitis are due, on the contrary, to an inflammatory condition, which may rapidly involve the entire organ, and place the patient's life in the greatest jeopardy. If the colic be of appendicular origin, an appendicitis in one of its forms is already in progress.

The view that the "colic" is produced by an attempt on the part of the appendix to rid itself of fæcal matter which has found its way into the tube, is refuted by the frequency with which fæcal matter, sometimes even in the shape of coproliths, is found post-mortem in cases in which no colic had occurred; and by the fact that as a rule no circular muscular fibres are present in the appendix, or when present, are in insufficient quantity—hence efforts at expulsion would be very feeble in character, and not calculated to give rise to the violent pains characteristic of the first stage of appendicitis.

The attempt to compare the mechanism of the production

of pain during the first stage of an attack of appendicitis to that which takes place in the initial stage of a hepatic, or of a nephritic colic, by supposing that a hard mass of fæcal matter engages in the orifice of the tube is equally fallacious. In the case of hepatic or of nephritic colic the offending body is either a gall-stone or an uric acid or oxalate of lime calculus, and there can be no question as to the ease with which these may produce local, as well as radiating pains, with constitutional disturbances. In the case of the appendix the pains cannot be explained in this manner. Here the fæcal matter, when present, is so soft as to be readily crushed between the thumb and finger, as I have repeatedly demonstrated to visitors at my clinics. The presence of these soft fæcal masses in appendices exposed in laparotomies done for other purposes, which can be readily felt upon palpation, and to which I have often called the attention of my assistants, also effectually disposes of the fancied similarity between an attack of appendicitis, and an attack of renal or of hepatic colic, even if the entire absence of fæcal concretions, and other foreign bodies in a large proportion of cases of the disease under discussion, was not of itself sufficient.

In view of these facts, therefore, the sudden occurrence of sharp colicky pains should always direct the attention of the practitioner to the appendix vermiformis, and a watchful care should be exercised over this apparently useless, and certainly treacherous, organ.

The location of the primary pain is usually referred to the neighborhood of the umbilicus. Next in frequency it is complained of in the epigastrium, very infrequently in the region below the umbilicus, and least frequently of all is it referred to the appendix itself. With the advance of the disease, and the occurrence of localized peritonitis, the pain is referred, in addition, to the right iliac fossa, or at this stage the latter may be the sole seat of the pain. The fact that the pain is so seldom located about the cæcum in the commencement of the disease is, in a large measure, responsible for many errors which have been made in the diagnosis.

It is difficult to find a suitable explanation of this peculiar

phenomenon. I have observed, however, in a case of artificial anus involving the cæcum and the first two inches of the ileum, that the application of the compressing enterotome of Dupuytren produced the same acute pains referred to the region of the umbilicus. Bacon, of New Haven, in a case in which he was compelled to remove the appendix under cocaine anæsthesia, remarked that the patient complained of pain about the umbilicus when the organ was grasped by a pair of forceps. In the case of the compressing enterotome the pain was doubtless produced by the blades of the instrument grasping the base of the appendix, as one of these passed into the cæcum, and the other into the ileum. When the blades were readjusted, and passed in an upward and inward direction, away from the appendix, relief of the peri-umbilical pain followed.

Coincidently with the attack of pain, or shortly thereafter, nausea and vomiting frequently occur. The appearance of these symptoms, in connection with pain about the umbilicus, is significant, in spite of the generally received opinion that the nausea and vomiting are only such as are frequently observed in ordinary attacks of acute indigestion, and which usher in many of the acute diseases. Even where indigestion and intestinal colic are responsible for the nausea and vomiting, the nausea is more apt to precede than to follow the colicky pains, as in appendicitis. The vomiting is a purely reflex symptom, due to an irritation having its origin in the appendix.

The vomiting is rarely persistent during the initial stage of the disease. It usually ceases when the contents of the stomach are evacuated, but may return with the occurrence of perforation of the appendix, rupture of an encysted sero-purulent collection, or of an appendicular abscess, or the condition of intestinal paresis. If nausea alone be present it is rare for it to last beyond the first two or three hours of the disease. The character of the vomiting in cases where it recurs after having once ceased, will vary according to the conditions present. If coincident with primary perforation of the appendix itself, or following it, when no adhesions have formed, or with rupture of an appendicular abscess into the peritoneal cavity, the vomiting will be explosive,

and the material evacuated from the stomach of the greenish serous character so common in general septic peritonitis. In intestinal paresis stercoraceous material may be ejected, in addition, as a result of a reversed peristalsis. When the intestinal tube is emptied, serous fluid which has gained access to the intestine from the peritoneal cavity by endosmosis, will be ejected more or less stained by its passage along the intestine (fæcaloid vomiting). During the first stage of the disease the patient may swallow more or less fluid without necessarily provoking vomiting, or even increasing the nausea. The vomiting which occurs in connection with perforation differs from this in that it is prolonged, incessant, and repeated, and is aggravated or provoked by any attempts to take medicine, or even small quantities of food or liquids.

Constipation may precede or accompany the attack. Obstinate constipation occurring in connection with the commencement of the attack is indicative of early intestinal paresis, and should be a warning to the attendant that he has to deal with a more than usually grave form of the affection. When this symptom appears later in the course of the disease, its character does not differ from that which occurs in the course of peritonitis due to perforation by other causes. Finally, this symptom may assume all of the characteristics of the obstipation which accompanies intestinal obstruction; namely, progressive distention, inability to pass gas per rectum, and the appearance of the shape and movements of the coils of intestine, which can be observed when the abdominal walls are sufficiently thin.

Tenderness in the right iliac region is an early and a marked symptom. While there may be more or less diffused tenderness in the fossa, it will usually be easy to indicate the site of the appendix by a correspondingly increased amount of tenderness at a particular spot. The usual location of the appendix will be found to be at the dextral edge of the right rectus abdominis muscle, at varying distances below a line drawn from the centre of the umbilicus to the anterior superior spinous process of the ilium (the omphalo-spinous line). The location of this point of tenderness will vary somewhat with the location of the appendix and its relation to the external surface of the abdomen, with the

length of the appendix, and with that portion of the long axis of the organ which is primarily the seat of the disease. It is manifest at a glance that an exceptionally long appendix, having its attachment to the cæcum normally placed, and the latter in the usual anatomical position, may, by becoming the site of an inflammation at its tip, give rise to very acute sensitiveness upon pressure at a point remote from the right iliac fossa, and at the same time the right iliac fossa be free from tenderness altogether. With an especially early and extensive involvement of the post-peritoneal connective tissue, there may be marked tenderness in the loin.

In the early stage of the disease tenderness is only elicited when pressure is made in the immediate neighborhood of the appendix itself. With the formation of adhesions about the organ the adjoining coils of small intestine, the ascending colon, the cæcum and frequently more or less of the overlying omentum, become matted together and fixed about the site of the original peritoneal inflammation. As a result of this, pressure upon other portions of the abdominal surface, by disturbing the underlying parts, will sometimes cause these in their turn either to drag or to press upon the parts involved in the focal point of inflammation. Symptoms of tenderness in the right iliac fossa will thus be elicited, if the portion of the appendix originally involved lay in this region.

In such cases, where the inflamed portion is located at a position remote from the usual position of the base of the appendix, this symptom, like that following direct pressure, will usually be referred to the point of focal inflammation, wherever that may be.[1]

In case of displacement of the cæcum from a short mesocolon, or because of the persistence of the early fœtal state the symptom of tenderness, as well as all other symptoms, may be entirely removed from the right iliac fossa and be transferred to the umbilical region, or even beyond this to a

[1] To this rule, however, I have observed occasional exceptions. With the appendix located quite remote from McBurney's point, I have still found the point of maximum tenderness at the latter.

point beneath the left rectus muscle (left-sided appendicitis). Three instances of left-sided appendicitis have already been reported by the author.[1]

Unless the possibility of this or some other anatomical abnormality is borne in mind, the entire train of symptoms will be misinterpreted, the true nature of the disease present may not be recognized and death may follow.

In palpating the surface of the abdomen while seeking for localized tenderness, the surgeon will note in some of the cases a certain amount of rigidity of the rectus abdominis muscle corresponding to the site of the primary focus of inflammation. This, as a rule, will be upon the right side. The symptom will be pronounced in proportion to the involvement of the corresponding portion of the parietal peritoneum. For instance, it will be well marked in those cases in which extensive adhesions form anteriorly, as in the matting together of the appendix, the anterior surface of the ascending colon and cæcum, and the overlying omentum. On the other hand it may be entirely absent in the early stage of the disease, before the formation of any adhesions, or late in the disease, when the adhesions which form are placed posteriorly to the appendix. Furthermore, absence of this symptom is not to be accepted as evidence against the existence of appendicitis, for in those cases in which the appendix passes into the pelvis, or is directed posteriorly and comes directly upward behind the cæcum, that portion of the parietal peritoneum corresponding to the rectus muscle may not become involved in the inflammation until late in the disease. Finally the occurrence of an encysted sero-fibrinous or fibrino-suppurative peritonitis following upon an appendicitis in which the abdominal wall forms a portion of the environment of the collection of fluid, will cause rigidity of the overlying muscular structure. General peritoneal inflammation will cause tension of all of the muscular structures of the abdomen.

As the disease advances tympanites from paretic distention of the adjacent coils of intestine takes place. Stokes has called

[1] See Medical News, Philadelphia, November 25, 1893, p. 604.

attention to the disturbances of function of portions of the intestinal tube that border upon structures which are the site of progressive inflammatory processes. With the spread of the peritoneal inflammation the coils of the intestine in the vicinity become more and more distended, and new ones become involved in the paretic condition. The effect of this will be to cause a bulging of the right as compared to the left iliac fossa, although this symptom may also result from the presence of an abscess cavity or an encysted sero-fibrinous or fibrino-suppurative exudation.

It is somewhat rare for the tumor itself, which is made up of the appendix and a mass of adhesions, to produce the bulging or prominence in the right iliac fossa just mentioned, unless suppuration has taken place. This bulging may occur, however, in very thin subjects.

Other symptoms present themselves, according to the position of the appendix and the part involved in the inflammation. More or less irritability of the bladder from peri- or para-cystitis occurs in those cases in which a long appendix passes into the pelvis and lies adjacent to the bladder at the time of the attack. Among these somewhat rarely observed symptoms are also to be mentioned retraction of the thigh, or partial flexion of the latter upon the trunk. This symptom is sometimes, although not invariably, observed in those cases in which the inflamed appendix rests upon the posterior layer of the parietal peritoneum, corresponding to the flexor muscles of the thigh. The retro-peritoneal connective tissue, and finally the sheath of the muscle may, under these circumstances, become involved by extension through the iliac fascia which separates the peritoneum from the muscles. The latter become disturbed functionally through interference with their nerve supply, and as a result their points of insertion are approximated and the symptom under discussion is produced.

The occurrence of a chill during the first stage of the disease is only occasionally noted, even in cases of more than usual severity. In certain cases it marks the occurrence of suppuration. Neither the severity of the primary attacks nor

the gravity of the subsequent lesions seems to bear more than a casual relation to the occurrence or pronounced character of this symptom.

The temperature and pulse vary in different cases, although they do not by any means bear a constant relation to the gravity of the attack. Generally speaking, an early and considerable elevation of temperature and rapid pulse rate accompany a high degree of inflammation, with tendency to early perforation or gangrene; but the reverse does not hold true. I have known perforation to occur before the formation of protecting walls of adhesions, with a pulse of 80 and a temperature of 99° F.

During the first stage of a case which is to follow the average course there will be an elevation of temperature of from one to three degrees Fahrenheit. This moderate elevation of temperature is apt to be misleading to the medical attendant. Failure to recognize the exact degree of inflammation of the appendix itself during the early stage of the affection would be of but very little moment were it not for the possibilities of perforation occurring prior to the formation of adhesions and consequent septic peritonitis; or the dangers of septic infection of a profuse sero-fibrinous exudate (suppurative peritonitis) without perforation, as well as the infection following the lymphatic vessels of the peritoneal investment of the appendix and thence to the general peritoneum.

A remission of all the symptoms of the first, second and third stages, save local tenderness, may take place, and yet the disease pass steadily onward through all its stages to a fatal termination. *A lowering temperature and lessening pulse-rate is not inconsistent with impending ulceration, perforation of the appendix into an unprotected peritoneal cavity, complete gangrene of the organ, or rupture of an appendicular abscess into the cavity of the peritoneum.*

The occurrence of diffused, followed by septic or suppurative peritonitis, will be announced by increased abdominal pain (unless this symptom be masked by the administration of opium), slowly increasing distension and progressive prostration. The pulse and temperature likewise indicate the occurrence of this

condition; the former by gradually increasing rapidity, and a correspondingly lessened force, and the latter by a gradual, but decided elevation; this rise is frequently followed by a fall which may reach a subnormal point. The features become pinched and drawn and the eyes sunken. The surface of the body, particularly the extremities become a bluish color, cold, and often bathed in a most profuse perspiration. Vomiting, which may have been present previously and copious, becomes scanty. The patient maintains a position upon his back, with the knees drawn up. The muscles of the abdomen are tense, and the latter is usually flattened rather than rounded. The respirations are short and rapid; hiccough is sometimes present at the very last. Albuminuria, with the presence of indican, are marked features; total suppression of the renal secretion may occur. The constipation is intractable.

If the intra-peritoneal sero-purulent fluid is encysted, the symptoms will be less urgent. From time to time there will occur acute attacks of pain, fever and vomiting, while the symptoms present a series of alternating exacerbations and remissions. The exacerbations under these circumstances are due to an occasional extension of the area of inflammation involved in the original focus, and perhaps an increase in the quantity of the encysted fluid which forces back the adhesions, and gives rise to new plastic exudation. The temperature does not become subnormal, but, on the contrary, may be higher than in the general suppurative form. The facies abdominalis is less marked, and the pulse is less rapid and feeble. The skin maintains its normal heat and color. The perspiration is less profuse, and may be absent altogether. There may be vomiting from time to time. The renal secretion is not suppressed, although, perhaps, scanty. Neither albumen nor indican are present as a rule.

A marked difference in the two forms of the affection will be found in the appearance of the abdomen. In the diffused septic form it seems as if the entire intestinal tube was completely paralyzed at the very outset, and that absolutely no intestinal gas found its way into the canal. As a result of this, a flattened appearance of the belly follows. On the other hand, in the

encysted variety, only those portions of the intestinal canal that come within the influence of the inflammatory area are disturbed in their functions, and then not to the same extent as in the fulminant form. These portions, in consequence, will become distended by gas forced into them from the still functionally active portions of the canal, and tympanitis, or marked meteorism, will become a more prominent feature of this variety. The abdomen will become more and more rounded, and finally barrel-shaped.

Spontaneous extra-peritoneal evacuation of the abscess occurs in a certain proportion of cases. The evacuation takes place comparitively seldom in the direction of the anterior abdominal walls. It may take place posteriorly, the purulent infiltration thence finding its way along the psoas muscle to the thigh; or it may follow the line of the vessels over the pelvic brim, and appear at the crural opening.

Again, evacuation may take place into the rectum, in which case, like its analogue—the abscess of tubal origin (pyosalpinx)—the fæcal communication gives rise to constant reinfection and refilling of the abscess cavity when it empties itself into the intestinal canal. Finally the bladder, and in the female the vagina, may serve as an outlet for the purulent collection.

The Diagnosis of Appendicitis.

The diagnosis of acute appendicitis is to be based upon the following symptoms: First, the suddenness of the attack; second, the occurrence of acute abdominal pain; third, tenderness at the site of the appendix; fourth, the occurrence of nausea and vomiting, either accompanying or following the pain.

The location of the pain is of special diagnostic value. In the great majority of cases it is at first referred to the region of the umbilicus, and to the epigastrium. In the course of a few hours, however, it becomes centred in the right iliac region, although more or less abdominal pain may still be complained of. The pain, as already mentioned, is acute, in the sense that it is sufficiently severe to transcend the powers of endurance of an average individual, and to demand measures of relief at the hands of the medical attendant. The severity of the pain, the

suddenness of the onset, the fact that it is referred to the epigastrium, or thereabouts—in addition to these, the occurrence of nausea and vomiting may distract the attention of the physician from the appendix vermiformis altogether. Prior to the last five years the diagnosis of acute indigestion or of a " bilious attack " was made in a large majority of these cases.

The character of the vomited material will vary with the ingesta. The stage of digestion reached, as shown by the vomited material, will correspond very closely with the time which has elapsed since the last meal was taken. In other words, the vomiting is not that of indigestion.

The patient assumes the dorsal decubitus almost without exception. Inspection, even at the very commencement of the disease, will frequently reveal, during the respiratory act, some limitation of movement on the part of the abdominal muscles, particularly upon the right side. This feature, however, may not be marked if opium has been freely administered. If it be permitted to manifest itself, it will become more and more marked as the disease progresses. Because of this limitation of movement on the part of the abdominal muscles concerned in the act of respiration, thoracic respiration becomes a feature of the attacks to a greater or less extent. With the patient narcotized with opium, the entire absence of this symptom is not to be relied upon as evidence against the existence of the disease.

In more advanced stages of the disease, adhesions having taken place, together with some inflammatory exudation, fulness opposite the anterior superior spine of the ilium, and beneath the right rectus muscle, will be observed. This may also be apparent along the line of Poupart's ligament, particularly in thin subjects. In cases in which the inflamed appendix lies upon the flexor muscles of the thigh as they pass along the posterior limits of the iliac fossa, the right thigh, or even both thighs, may be flexed. That this symptom does not possess the diagnostic value formerly attributed to it, however, is shown by the fact that in two instances coming under my observation, in which the post peritoneal connective tissue was the seat of a large purulent collection, this symptom was entirely absent. In both cases the appendix was extra-peritoneally situated.

The patient's facial expression is not usually indicative of a serious abdominal lesion in the first stage of the disease, but with the advance of the latter the characteristic anxious look of peritoneal inflammation develops (facies abdominalis, facies Hippocraticus).

Progressive abdominal distention, as the peritonitis becomes less and less localized, develops with the advance of the disease, and intestinal paresis becomes more and more marked. As a consequence the abdomen becomes rounded, and sometimes even barrel-shaped, significant of general peritonitis.

Abdominal distension may be due to the constipating effects of opium, or to an accumulation of gas, without the occurrence of peritonitis. This will give rise to much discomfort, but other symptoms of general peritonitis will be absent. Richardson, of Boston,[1] advises auscultation of the abdomen in differentiating between the two conditions. Where the distension is due to paralysis of peristalsis due to peritonitis and sepsis, no sounds whatever will be heard on auscultation. On the other hand, where the distension is due to the less grave condition, there is no inhibition of peristalsis, and evidences of intestinal action will be obtained.

Palpation shows tenderness in the right iliac fossa, and a sensation of tension or even rigidity is imparted to the palpating hand in certain cases by contact with the muscular walls of the abdomen, particularly the right rectus muscle. Pronounced tenderness in the right iliac fossa, unless masked by the administration of opium or some other equally powerful narcotic, is as pathognomonic of appendicitis as rusty sputum is of pneumonia. Involuntary muscular tension is not equally marked in all cases in the beginning of the disease. The presence or absence of this symptom seems to bear some relation to the proximity of the inflamed appendix to the anterior abdominal wall and to the extent to which the patient has been narcotized by opium in the treatment.

The sensitiveness will be slight or well marked according to

[1] American Journal of the American Sciences, January, 1894, p. 7.

the stage of the disease, and the severity of the attack. This is the feature of the disease which forms the best diagnostic guide, and indicates more than all the other symptoms combined the progressive character of the attack. Its increase from day to day, and sometimes even from hour to hour denotes increase in the gravity of the case. On the other hand, marked and rapid lessening of the tenderness both in intensity and in area (providing always that this symptom is not being masked in the particular case by the narcotic effects of opium), indicates, other things being equal, a subsidence of the inflammatory action.

The tenderness may be present over an area as large as the palm of the hand, even in the first few hours of the attack, but as a rule it is limited at this time to a point near the centre of the right iliac fossa. Here its presence will be determined by pressure with the points of the fingers.

Providing the case is seen sufficiently early to permit of the necessary manipulation, the following method of examination will be found to give the most satisfactory results:

The tips of the fingers should be laid flatwise upon the abdominal wall and steady pressure made directly backward until the smooth regular surface of the iliac fossa is felt. The finger tips are moved about, the abdominal wall moving with them, and the fossa thus explored. Pressure made in this manner may be repeated until the entire right half of the abdomen has been systematically examined. Tenderness at several points may be elicited.

As the disease advances another point of special tenderness develops parallel with Poupart's ligament, and just opposite and below the anterior superior spinous process of the ilium. This is due to adhesions which form between the dextral surface of the caput coli and cæcum and the lateral pelvic wall. When pressure is made in this region there is greater dragging upon the parts adherent at this point than elsewhere, owing to the rigidity of the pelvic wall. Distinct tenderness nearer the median line, about the umbilicus or in the supra-pubic region denotes a corresponding position of the inflamed appendix. Tenderness limited to a very small spot may sometimes be elicited by placing the finger

tip firmly against the abdominal wall and bidding the patient cough.

Treves has laid stress upon palpation through the rectum. I have been able in this manner to demonstrate a greater degree of tenderness upon the right than upon the left side. The "sausage-shaped" tumor described by Treves, I have seldom been able to make out. Generally speaking, it is not possible to demonstrate by means of a rectal examination in these cases anything which can not be made out much more satisfactorily by external examination; if the examining surgeon is to be the operator in the case he will do well to keep his finger out of the rectum.

Examination per vaginam when the disease attacks the female is thought to be of value by Lenander.[1] If the inflamed appendix lies upon the "S." or "S. E." line, and extends into the pelvis, the tumor may be felt from the cavity of the vagina. It will be exceedingly difficult in these cases, however, to differentiate by this method of examination between appendicitis and right-sided salpingitis or pyosalpinx; in fact, nearly all of the inflammatory lesions of the adnexa involve pain, tenderness and tumefaction. The appendix may even be involved in tubo-ovarian lesions.[2] Under these circumstances a differential diagnosis without exploratory laparotomy will be impossible.

Sensitiveness may be marked in locations remote from the right iliac fossa, due to an unusually long appendix in which the inflammatory process is most marked at the tip, or to an abnormally-placed cæcum. In addition to those cases in which non-descent of the cæcum is present (the latter maintaining the position in which it lies in early intra-uterine life, namely, in the neighborhood of the umbilicus), this portion of the intestinal canal may be located in the right hypochondrium behind the liver. When this happens the tenderness may be most marked at varying distances above the transverse line "W. E."

The following case, referred to me by Dr. F. E. Wilson, and

[1] Upsala Lakareforen, Forhandl., Vol. XXVIII, part 1; Centralblatt für Chirurgie, No. 16, 1893.

[2] Richelot, Bulletin Societé de Chirurgie, October, 1890.

operated upon at St. Mary's Hospital, illustrates this somewhat rare condition:

M. C. F., aged fifteen, developed the usual symptoms of appendicitis. There was marked tenderness at the site of the gall-bladder. She was seen by me on the third day of the disease and sent at once to the hospital for operation. Upon opening the abdomen and exploring its cavity the cæcum could not be found in the right iliac fossa, but the transverse colon was found to descend to the level of the pubes, a

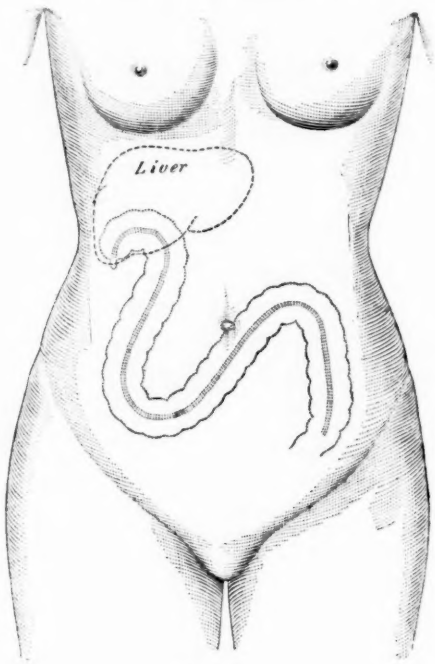

FIG. 10.

portion of it occupying the usual site of the ascending colon. An attempt to follow the colon at first resulted in tracing it to the splenic flexure. I then examined it in the opposite direction, and succeeded in finding the cæcum immediately behind the liver. The liver was held out of the way by my assistant, and the appendix cleared from its surrounding adhesions and removed (Fig. 10).

The presence of a tumor may be made out by palpation, provided the disease has advanced sufficiently far to make this

FIG. 11.— Cystic Dilatation of the Appendix.

symptom available, or the rigidity of the right rectus muscle is not so great as to mask its outline. There should be but little liability to mistake in the male when the tumor has once been made out and due weight has been given to the history; in the female it is different. Here the condition may so closely resemble a right-sided pyosalpinx that the most skilful diagnostician may be at fault, particularly in those cases in which a long appendix passes down into the pelvis. Fluctuation is rarely made out.

Exceptionally a tumor may be felt at an early period of the case, especially in patients with more than usually thin abdominal walls, and in whom the symptoms of rigidity of the right rectus muscle is absent.

A case illustrative of this was admitted to my service at the Methodist Episcopal Hospital, on October 6, 1893.

A tumor was distinctly made out by the attending physicians, Drs. Mains and Sturges, on the afternoon of the day following the attack, twenty-nine hours after the first symptoms. The tumor was located directly behind the internal abdominal ring, was very tender to the touch, and appeared from external palpation to be the size of a small hen's egg. It was somewhat freely movable. Its localization was greatly facilitated by the entire absence of rigidity of the right rectus abdominis muscle. A right lateral laparotomy (oblique incision) revealed an appendix in the "S." position, the seat of a cystic dilatation at its proximal end. The dilated portion was about the size of a small walnut. (Fig. 11). There was complete absence of adhesions, except the attachment of a portion of omentum to the sinistral side of the appendix.

Lumbar tenderness may be more or less marked according as the peritoneum be involved in this locality, or as the inflammation extends into the post-peritoneal connective tissue. Under ordinary circumstances the symptom of lumbar tenderness is not of great diagnostic value, except as a means of assisting in establishing the probable location of the appendix before an operation.

Percussion will give a note, high-pitched, dull, or even flat, when extensive and dense adhesions have formed, or when sup-

puration has occurred in these adhesions as a result of an infection from the appendix. This percussion note becomes more marked with the advance of the disease, and as the adjoining coils of the intestine give a note which is tympanitic by comparison. In cases in which an extensive and diffused serous effusion into the peritoneal cavity occurs, dulness may be found on percussion over the latero-dorsal portions of the abdomen.

In percussing the region of the colon and cæcum the fact should be borne in mind that impacted fæcal matter in this locality may simulate a tumor due to appendicitis. Tenderness may also be present due to impacted fæces.

Exploratory puncture is to be mentioned only to be condemned. Its employment adds a new element of danger to the case, while its results are unreliable, and calculated to lead the surgeon into error, particularly if these be negative.

The occurrence of fever is of some diagnostic importance in determining the presence of the disease, when taken in conjunction with the other symptoms; but, unfortunately, when not of a high degree it cannot be relied upon as an indication of the character or extent of the inflammatory process. A slight rise of temperature is not incompatible with early and fatal perforation. Again, this, together with the subjective phenomena may disappear almost entirely, and yet the life of the patient be in the greatest jeopardy. Cases which do not pass beyond the first stage, and are of a very mild type, may be afebrile, yet even these will bear watching very closely.

Differences in temperature between that of the axilla and the mouth on the one hand, and that of the rectum and the vagina on the other, should always be taken into account in cases of suspected appendicitis. A difference in favor of the latter localities of more than a degree and a half may be regarded as diagnostic (Madelung), although the absence of this symptom is not to be regarded as significant.

The occurrence of a chill is of such slight importance during the first stage of the disease, as not to merit particular notice in this connection. Even in the subsequent stages when suppuration is in progress it cannot be regarded as a frequent nor

as an important symptom. The clinical fact that intra-peritoneal suppuration does not give rise to chills or chilly sensations, much less to a rigor, as frequently as do suppurative processes elsewhere, may here be noted.

In the average typical case of appendicitis there should be no greater difficulty in making a diagnosis than the ordinary physician finds in arriving at a conclusion in a case of pneumonia.[1] Every case of colicky pain in the abdomen, suddenly developed, with right-sided tenderness, should be regarded as a case of appendicitis until this supposition be disproved. The accusation should be made, as it were, and the burden of proof should be placed upon the appendix to show its innocence. Every peritonitis is of traumatic origin, whether localized or diffused. All cases of peritoneal inflammation occurring without well-established determining causes other than this, should be ascribed to some lesion of the vermiform appendix.

In order to facilitate the diagnosis in doubtful cases, it may be useful to place before our minds in this connection the various conditions for which appendicitis may be mistaken.

Indigestion.—This has already been dwelt upon. Too much stress, however, cannot be laid upon the importance of looking beyond the stomach itself in order to account for epigastric pain and vomiting.

Pneumonia and Diaphragmatic Pleurisy.—Professor Janeway, at a meeting of the New York Academy of Medicine, in the course of a discussion upon appendicitis, stated that he had known this error in diagnosis to occur.

Rupture of the Gall-bladder.—This error was made in one of my own cases of laparotomy. The accident occurred while the patient was intoxicated, and no definite history could be obtained other than the sudden occurrence of general and severe pain. The tenderness was right-side, and this, together with the rigidity of the right rectus muscle, and the existence of peritonitis, led to an exploratory incision which revealed the true state of affairs.

Hepatic Colic.—An error of diagnosis may easily be made

[1] Talamon.

during the paroxysm of acute pain in appendicitis by mistaking the attack for hepatic colic. The prominent general symptoms of sudden onset, paroxysmal pain, nausea and vomiting, rigid abdominal wall, prostration and an anxious facial expression in rapidly developing appendicitis are common to both. So far as the last three symptoms are concerned, their occurrence is so uniformly present, and so similar in the two conditions, that they may be dismissed as offering no diagnostic advantage. With care an error in diagnosis should not last longer than twenty-four hours, at the end of which time the localization of the symptoms of pain and tenderness in the right iliac fossa is complete.

The same remarks will apply to the occurrence of nephritic colic upon the right side. This is more likely to confuse the diagnosis than hepatic colic.

The following table will show at a glance the points of the differential diagnosis of hepatic colic, nephritic colic, and the initial stages of appendicitis:

TABLE OF COMPARISON BETWEEN:

APPENDICITIS.	HEPATIC COLIC.	NEPHRITIC COLIC.
Pain.—Peri-umbilical, and referred to the epigastrium as well. Does not radiate above these points. Fixed point of pain in the right iliac fossa.	*Pain.*—Referred to the epigastrium, and radiates toward the shoulder and the point of the scapula. Starts from the region of the gall-bladder as a fixed point.	*Pain.*—Radiates towards the groin and testicles, and sometimes to rectum, giving rise to desire to go to stool, and to tenesmus.
Sensitiveness. — Greatest in right iliac fossa. Point pressure reveals an especially tender point upon the outer edge of the rectus abdominis muscle, just below the omphalo-spinous line (McBurney's point).	*Sensitiveness.*—Extreme beneath the lower border of the ribs. Tenderness over gall-bladder.	*Sensitiveness.*—Greatest posteriorly over the pelvis of the kidney. If tenderness exists in front it is greatest over Poupart's ligament.
Vomiting.—Occurs but is not repeated after the first attack, as a rule.	*Vomiting.*—Frequent and intractable.	*Vomiting* not a frequent nor a prominent symptom.
Bladder and Testicle.—Symptoms very rarely present.	*Bladder and Testicle.*—Symptoms absent.	*Bladder* irritable; dysuria and vesical tenesmus; occasionally hematuria. *Testicle* retracted.

Floating Kidney upon the right side, with twisted pedicle, may be eliminated by very much the same line of reasoning as in renal colic. The history of a movable tumor, existing before an attack, will assist in the diagnosis.

Intestinal Obstruction is suggested by some of the symptoms of appendicitis, particularly if the point of the obstruction is near the ileo-cæcal region. The following cases of more than usual interest will serve to illustrate the difficulties of diagnosis in this condition:

J. W., aged twenty-nine, of previous good health, was suddenly attacked with violent abdominal pain referred to the right iliac region, and with vomiting. Upon the occasion of my visit he lay in bed in the dorsal position, his knees drawn up, and a most anxious expression upon his face. The skin was of a muddy color, cold, and bathed in perspiration. The finger-nails were blue. The pulse was rapid (130) and feeble; temperature 102° F. Fæcal vomiting had been present for two days. No movement of the bowels nor passage of gas per rectum had occurred since the first day of the attack, five days previously. The abdomen was barrel-shaped, and highly tympanitic. There existed a point of especial tenderness in the right iliac fossa. No tumor could be made out. A provisional diagnosis of primary appendicitis, with subsequent intestinal obstruction, either from intestinal paresis or angulation, was made. Exploratory laparotomy was advised and accepted.

A vertical incision at the dextral edge of the right rectus muscle was made, and the parts about the cæcum were exposed. A number of coils of distended small intestine presented themselves. The intestinal obstruction was found to be due to an encircling band, consisting of an unusually long diverticulum (Meckels), the remains of the vitello-intestinal duct, which had become wrapped around a portion of the ileum close to the ileo-cæcal valve. The tip of the diverticulum was attached to the mesentery of a portion of intestine which it grasped, by an inflammatory adhesion of recent occurrence.

E. A., female, aged twenty-four, married, had previously suffered from some intra-pelvic inflammatory lesion. She was admitted to my service, at the Methodist Episcopal Hospital, with a history of having been suddenly attacked with severe abdominal pain and vomiting five days before. The pain, at first general, was finally referred to the right iliac region. The vomiting was persistent and uncontrollable, but not stercoraceous. Obstinate constipation existed. Tenderness over the supposed site of the base of the appendix was well marked, and all attempts to divert the patient's

attention from this point, when making pressure upon it, failed. On May 15, the day of her admission, a right-sided laparotomy was performed by my assistant, Dr. Delatour. The appendix was found to be normal. The small intestine was bound down by old adhesions in the pelvis and just behind the cæcum. Separation of these relieved the obstruction, and the patient made a good recovery.

Cases of true internal hernia are comparatively rare. The following case is of interest from this fact, as well as because the symptoms were such as to convince the medical attendant that he had to deal with a case of appendicitis:

F. A. B., male, aged twenty-one, was admitted to my service at the Methodist Episcopal Hospital August 21, 1892. Two days before he had been attacked with sudden pain, referred to the right iliac region, and with vomiting. The pain became so severe as to require hypodermatic injections of morphia for its relief. The vomiting became persistent, the constipation complete, and the prostration extreme. The treatment prior to his admission to the hospital had been mainly the administration of opium, but in spite of this and the distention, tenderness was more marked beneath the right rectus muscle and below the level of the umbilicus than elsewhere. A median incision was made, and a hernia of a portion of the ileum into the fossa duodeno-jejunalis of Treves was found, with the musculus suspensorius duodeni of Treitz acting as a band. The patient failed to rally, and died at the end of twelve hours.

The inflamed appendix itself, by acting as a constricting band, may be the cause of the obstruction, and lead to uncertainty in the diagnosis, as is shown by the following case:

A. A., aged twenty-four, was admitted to my service at the Methodist Episcopal Hospital suffering from symptoms of intestinal obstruction. The attack had been marked at the beginning (seven days before his admission) by diffused abdominal pain, followed by vomiting, and finally by pain in the right iliac region. The vomiting persisted, and finally became intractable; the abdomen was distended and tympanitic; the facial expression was characteristic of a grave abdominal lesion; stercoraceous vomiting finally occurred. He was in a condition of great prostration at the time of admission. A

median abdominal incision was made for exploratory purposes, and the cause of the obstruction was found to be the appendix. As a result of the inflammation, the tip of this organ had sloughed away, and the stump had become adherent to the mesentery of the ileum, just at its point of attachment, in such a way as to compress the latter against the cæcum.

Acute mechanical obstruction, the result of internal hernia, ileus, invagination or strangulation by bands from old inflammatory adhesions, will give rise to symptoms that are characterized by their sudden onset and severity. The pain occurs in exacerbations, and is generally referred to the seat of the obstruction or to the neighborhood of the umbilicus. In the latter case the differentiation will be attended with greater difficulties in the first few hours of the attack than later on, when, if the case prove to be appendicitis, the pain will be centered in the right iliac region; while if intestinal obstruction be present, it will remain centered at the umbilicus or at the seat of the invagination or strangulation. As shown in the cases cited, if the latter chance to be at the site of the appendix the difficulties of diagnosis may be increased. On the other hand, the vomiting in appendicitis is not constant or easily provoked, as is the case in intestinal obstruction; in the latter there is also obstinate constipation, with inability to pass flatus. Later on, the vomiting, caused by the voluntary efforts made by the patient, changes to a regurgitation of fæcal matter from the reversed peristalsis; the sufferer as he lies upon his side simply ejects from the angle of his mouth what passes into it from the œsophagus.

In invagination the occurrence of tenesmus and the passage of bloody mucus will aid in the diagnosis. A tumor may often be made out by both abdominal and by rectal palpation. In strangulation caused by a band of adhesion in the adult, the history of a previous attack of peritonitis will usually be obtained. In children, both band and malposition of portions of the intestinal canal, causing obstruction by strangulation, may result from fœtal peritonitis. In ileus a history of pre-existing peritonitis is wanting. In acute intestinal obstruction from any cause with advancing peritonitis, a rapid and general distension occurs due

to the combined effects of the mechanical obstruction and intestinal paresis; in appendicitis and its resulting peritonitis the distention is the result of intestinal paresis alone, and is less rapid in its development.

Dropsy and Empyema of the Gall-Bladder.—The symptoms of this condition may appear suddenly, and simulate an attack of acute appendicitis. The resulting tumor may reach as low down as the omphalo-spinous line, and the tenderness be limited to this point.

M. S., aged twenty-eight, female, was suddenly attacked during the night with acute abdominal pain which radiated to the right renal, lumbar and iliac regions. Vomiting followed the onset of the attack. The pains were allayed by very small doses of opium, but a tender tumor was found beneath the dextral edge of the right rectus muscle, directly opposite the anterior superior spinous process of the ilium. These symptoms were all reported to me by her family physician, Dr. Amador, on the second day of her illness. When I saw her the right rectus muscle was rigid, her temperature was 102° F., and her pulse was 120. She was removed to St. Mary's Hospital for immediate operation. The usual right-sided vertical incision was made through the abdominal wall, and a distended gall-bladder was revealed. There was some peritonitis in the neighborhood, and adhesions existed between the gall-bladder and the adjoining coils of intestine, and also the omentum. The gall-bladder was placed abnormally low in the peritoneal cavity, and this fact, together with the unusually rapid symptoms, accounted for the ease with which the case was mistaken for one of appendicitis. The gall-bladder was incised, giving exit to about four ounces of colorless viscid fluid, and finally to some pus. The edge of the viscus was then sutured to the peritoneal wound. The case was one of occlusion of the cystic duct from impacted biliary calculus, which subsequently escaped with the discharges, together with an inflammation of the gall-bladder itself and an accumulation of secretion which subsequently underwent suppuration.

Dropsy of the gall-bladder, occurring in connection with the presence of a gall-stone occluding the cystic duct alone, may simulate, by an occasional remission of the symptoms, the chronic relapsing form of appendicitis:

W. V., aged sixty, female, was admitted to my service in the Methodist Episcopal Hospital, and the following history was obtained: Six weeks previously she was suddenly attacked for the first time with acute pain in the right hypochondriac and iliac regions, followed by nausea and vomiting. The pain was finally relieved by opiates and hot fomentations. During the following six weeks more or less pain and tenderness persisted, referred, as she expressed it, "to the right side." On October 31, 1893, two days prior to her coming under my observation, she suffered from a recurrence of the original symptoms. At this time Dr. Brinkman visited her, and discovered a tumor beneath the right rectus abdominis muscle, extending from a point about an inch above the level of the anterior superior spinous process of the ilium, along the ascending colon, for a distance of about three inches. Point-tenderness at the so-called McBurney's point was well marked; at no other point upon the anterior abdominal surface could such extreme tenderness be elicited. There was no jaundice.

A right-sided vertical incision exposed the tumor, which was found to be a distended gall-bladder. There was considerable peritonitis in the neighborhood, and the gall-bladder lay over and upon the ascending colon, to which it was adherent. It was also united by adhesions to the right lobe of the liver. The gall-bladder was opened and emptied of about three ounces of clear, but rather thin mucous fluid. Further investigation showed the presence of a single gall-stone of a conical shape, without facets, and about the size of the last joint of the little finger. The apex of this stone was firmly fixed in the opening of the cystic duct.

With a history of preceding attacks of indubitable hepatic colic and the occurrence of pain referred to the hypogastrium and epigastrium at the commencement of the attack, the case may go on for a considerable time before symptoms of a sufficiently distinctive character are present to suggest even an exploratory incision, as shown by the following case:

M. R., aged fifty-eight, female, was admitted to St. Mary's Hospital with the following history: She had suffered from several attacks of hepatic colic in the past. About six weeks prior to my visit she was suddenly attacked with acute abdominal pain referred to the epigastrium and right hypochondrium. Since the attack she had been

confined to her bed with exacerbations of fever and more or less pain referred to the right hypochondriac and iliac regions. A tumor was finally discovered in the latter; its fluctuating character could be distinctly made out by palpation through the abdominal walls. The bulging of the wall at this point was likewise most pronounced.

A right lateral laparotomy revealed a large collection of sero-purulent fluid in the right iliac fossa. Upon emptying this a small opening was found which passed dorsad to the cæcum and toward the median line and communicated with another cavity to the sinistral side of the colon. This second cavity also contained a large collection of sero-purulent material.

Upon exploring the right iliac fossa the appendix vermiformis was found lying in the "S. E." position. A portion of the organ had become detached from the remainder and was readily lifted from its bed of adhesions and removed. No ligature could be applied, and, owing to the patient's unfavorable general condition, it was not deemed wise to continue the operation to the extent of removing the remainder of the appendix.

At no time during the patient's convalescence was there any trace of biliary secretion in the discharges or upon the dressings. The occurrence of fæcal communication retarded the recovery, due to sloughing away of the remainder of the vermiform process.

Extra-uterine Pregnancy.—The sudden rupture of the sac of a right-sided extra-uterine pregnancy may simulate appendicitis. The occurrence of great prostration, amounting in some cases to collapse, excessive thirst, air hunger, and other symptoms of internal hæmorrhage, the menstrual history and the results of a pelvic examination will be sure to differentiate the two conditions.

Pelvic Hæmatocele.—Hæmorrhage from the pampiniform plexus of the right side, will suggest by the suddenness of the onset and the accompanying pain, an attack of appendicitis. If the hæmorrhage is intra-peritoneal, a large quantity of blood may be lost in a short time, and the symptoms of active and excessive hæmorrhage develop. In instances where the hæmorrhage is extra-peritoneal, the more urgent symptoms due to rapid loss of blood will be absent. A more or less pronounced tumor with a rather doughy feeling, situated between the folds of the broad ligament and felt on vaginal examination lying

in one or both lateral fornices, or in the cul-de-sac of Douglas, will be found. In addition to this, some irregularity in the menstrual period immediately preceding the attack, and in some cases the recurrence of the flow after the regular menstrual molimen has passed, will all be diagnostic points of value.

Morbus Coxarius.—The flexion of the thigh upon the abdomen, together with lateral inclination of the pelvis, occurring in young children from whom it is difficult to obtain an intelligent statement as to the seat of pain and tenderness, may lead to an error confounding this disease with morbus coxarius (Gibney).

Typhoid Fever and Entero-colitis.—Attention to the cardinal symptoms of appendicitis and a knowledge of the clinical course of these affections will certainly prevent the intelligent practitioner from confounding an attack with typhoid fever or with entero-colitis, yet I have seen both of these errors of diagnosis made.

NOTE.—Since the appearance of the January number of the ANNALS, Dr. Hodenpyle has deemed it best to somewhat modify the conclusions which he had drawn from his studies upon the etiology of appendicitis, This modification relates principally to the rôle which the *B. coli communis* plays in the causation of the disease, as the sole infecting agent. This germ grows with extreme rapidity in cultures and may thus conceal, as shown by Barbacci, of Florence, more slowly growing and less conspicuous, but quite as infectious, forms of micro-organisms.[1]

[1] New York Medical Journal, December 30, 1893.

[TO BE CONTINUED.]

ENTERO-ANASTOMOSIS FOR MALIGNANT STENOSIS OF THE DIGESTIVE TRACT.[1]

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AT a meeting of this society, held on March 23, 1892, I exhibited two patients upon whom I had operated during the previous year for the relief of symptoms due to malignant stricture of the digestive canal. Both these patients died during the present year, and it was my good fortune to obtain autopsies and thus be able to present with the completed histories the specimens showing the end results in both cases.

The first case was one of carcinoma of the pylorus, for which I did a gastro-jejunostomy.

Laura W., a German woman, thirty-one years old, of healthy parentage and good personal history, was first seen by me on August 7, 1891. Eighteen months before she had been delivered of twins after a severe labor. Her convalescence had been protracted by fever, persistent vomiting and abdominal pain, with marked distention but no diarrhœa. By the end of three months most of her symptoms had disappeared, but she did not regain her original good health, being frequently compelled to seek her bed on account of vomiting. This had borne no relation to the ingestion of food, having been usually most severe in the evening, when "she vomited everything taken during the day." The appetite had been unimpaired, but there had been progressive loss of flesh and strength. The vomitus had been at times dark brown, like "coffee grounds." She had noticed for about a year a lump in her abdomen, just below the margin of the ribs on the right side. It had not been particularly sensitive and had increased but little during the two or three months preceding.

[1] Read before the New York Surgical Society, October 11, 1893.

The abdomen had been at times more distended than at others, and there had been occasional temporary attacks of slight jaundice, with light colored stools. The vomiting, unaccompanied by nausea, had lately become more frequent and her anæmia and emaciation extreme. She had been confined to bed for nearly a week by excessive weakness and for the last two days had retained literally nothing upon the stomach. On the following day (August 8, 1891) I sent her in to my service at St. Luke's Hospital.

Physical examination showed some impairment of resonance, with harsh breathing, prolonged expiration and increase of voice at right apex anteriorly. Over the rest of chest somewhat feeble breathing. There was slight comparative dulness over right upper chest. At left apex, posteriorly, a few small moist râles could be heard at the end of inspiration. The breathing at right base was feeble and somewhat jerky.

The liver dulness began at the sixth rib and continued uninterrupted to level of the umbilicus in nipple line.

Palpation of the abdomen revealed little, except that the liver projected below the ribs and that a firm, almost insensitive mass extended from its lower surface in the direction of the moderately dilated stomach. This mass descended on inspiration and gave forth a flat note on percussion. The spleen extended to the anterior axillary line. The abdominal wall was very relaxed and there was some separation of the recti muscles. There was slight impulse on coughing at umbilicus, and the striæ were very prominent. The inguinal glands could be easily felt on both sides. The tongue was slightly coated. The urine was of low specific gravity and contained a trace of albumin, but no casts.

She spent a good part of the subsequent night vomiting. On the day following thorough gastric lavage was performed and much dark brown pasty fluid evacuated of acid reaction, which contained considerable mucus, fibrinous looking shreds and many undigested grape pulps and seeds, but no free hydrochloric acid.

The patient was positive that she had eaten no grapes within ten days, remembering distinctly the occasion on which she had last eaten them. Much relief was experienced and the subsequent day found her more comfortable than for many weeks, the vomiting having ceased. On the fourth day food was withheld for several hours, and two hours after a thorough lavage a test meal of tea and toast, without butter, milk or sugar was given. After an hour and a

half this was siphoned off and found to contain no hydrochloric acid. During the succeeding month lavage was practiced every few days and the evacuated material frequently tested for hydrochloric acid without ever finding it present. For about two weeks occasional grape seeds were found in the vomitus.

The patient was unfortunately not weighed on her entrance, her weakness contradicting any unnecessary exertion, but at the end of a week, having very perceptibly gained, she was found to weigh eighty pounds. Her feebleness was still so marked that operative measures were postponed. During the succeeding months lavage was practiced every few days, and careful stomach feeding supplemented by nutrient enemata after the method of Huber[1] so improved her general condition that her weight rose to eighty-seven pounds. As improvement seemed now arrested she was prepared for operation by careful regulation of the bowels and more frequent lavage.

On September 25, 1891, assisted by my colleague, Dr. B. F. Curtis, I did a median laparotomy above the umbilicus. The mass proved to be the pyloric extremity of the stomach, enlarged, hard, and adherent to adjoining structures. The gastric walls were infiltrated by the growth for about one-third of the distance in the direction of the cardia, but it stopped abruptly at the gastro-duodenal junction, as Rokitansky has pointed out to be the rule.

The tumor was so large and fixed, and the stomach so dilated as to necessitate a second incision through the parietes, at right angles to the first, involving the left rectus muscle. Pylorectomy being evidently contra-indicated I proceeded to find a portion of the small intestine to approximate to the stomach. A loop was caught and followed some distance without recognition. On reversal of the direction of search a fixed portion was identified as the jejunum by lifting the transverse colon with the great omentum, after the method of Hahn. About two feet distant from this point a portion of intestine was selected and brought outside the abdomen. After isolating several inches by constriction with thin ribbons of iodoform gauze, the two viscera were approximated by a slight modification of the method proposed by Barker, of London.

The selected intestinal loop, and the anterior gastric wall, were laid together in such a manner that, as Rockwitz advised, their peris-

[1] A. Huber, Deutsch Archiv. f. klin. Med., Bd. XLVII.

taltic waves corresponded in direction, and their serosa united for a distance of about four inches by a line of continuous suture of black silk. Next the serosa and muscularis were incised for more than three inches parallel to and about an eighth of an inch from this line, and the now posterior free edges of these incisions united in a corresponding manner by over-hand sewing, the needle embracing a portion of the submucosa, but not entering the lumen of the gut, and the threads crossing the cut edges of the muscularis and serosa, as in the formation of a button-hole. The mucosa of the stomach was then opened, and at this point the operation was delayed until, by means of a large stomach tube attached to a syringe, a considerable amount of stomach contents could be evacuated. This having been satisfactorily accomplished without soiling the wounded surfaces I proceeded, after opening the intestinal mucosa for the same distance, to make a continuous circular suture of the gastric and intestinal mucosa. I had now two posterior lines of serous or sero-muscular suture, and a complete mucous suture. The remaining anterior layers of suture were applied in a corresponding manner, except in reverse order. The apposition thus completed consisted of three lines[1] of suture, serous, sero-muscular, and mucous, with an anastomotic opening of nearly three inches. In order to guard still further against leakage, a portion of great omentum was wrapped about the line of suture, and secured by two interrupted stitches.

The organs were then replaced in the abdominal cavity, and the wounds closed by a double layer of suture, a continuous peritoneal of fine catgut, and an interrupted extra-peritoneal of silk, including muscle and skin. The whole operation lasted an hour and fifty minutes, the actual time of suturing, sixty-one minutes, from which should be deducted from ten to fifteen minutes spent in emptying the stomach.

At the close of the operation a stimulant enema of whiskey was given, and upon the patient's reaching the ward, the foot of the bed was elevated, and the patient surrounded by hot bottles. Pulse, 135. She reacted perfectly, and passed a fairly comfortable night, after a small hypodermic of Magendie's solution of morphia.

There was some slight passive regurgitation of fluid, easily con-

[1] The writer refers not to the structures embraced in the suture, but those approximated.

trolled, however, by elevation of the head of the bed, and the application of iced cloths to the neck.

On the following day milk in small quantities, frequently repeated, was given, but soon discontinued, as it provoked nausea and vomiting. During that evening the stomach tube was introduced and about a pint of dark brown fluid withdrawn. The milk was again commenced a few hours later, but was not long retained, and its use discontinued for six hours. No further vomiting occurred. On the eighth day the stitches were removed, and union found, except at one small spot, where the edges had been everted. By the end of the second week the wound was soundly healed.

She was allowed out of bed during the fourth week, and was soon about the ward. The nutrient enemata were stopped at the end of the first week, and thereafter a gradually increasing selected diet was allowed.

She left the hospital eight weeks after the operation, and went to a convalescents' home in the suburbs, where her appetite became ravenous, and she gained rapidly in flesh and strength, her weight soon reaching 110 pounds.

She returned to her home about the 1st of December, 1891, and resumed her usual household duties, which she continued without interruption until the 1st of June, 1893. During these eighteen months she had no vomiting, and but little discomfort of any kind, except that during the last three months she had been perceptibly growing thinner and weaker. Her weakness and emaciation increased more rapidly from that time, so that by July 4, 1893, her weight had fallen to seventy-seven and a fraction pounds, just about the condition in which I first saw her, except that now there was no vomiting, only a dull pain in the abdomen, and excessive weakness. She died from exhaustion on July 31, 1893, a few days over twenty-two months from the time of operation, and about three years from the time when the lump was first discovered in her abdomen.

The autopsy showed:

A tall, greatly emaciated frame, with little or no panniculus adiposus; left lung, no adhesions—upper lobe, several cavities, cheesy nodules, and a few small tubercles, lower lobe, few cheesy nodules and tubercles; right lung, many adhesions and gray tubercles, cheesy nodules, and small patches of broncho-pneumonia; liver, spleen and kidneys negative; bladder, in post, right wall a flat mass one millimetre in diameter, and yellowish in color.

Transverse colon and omentum adherent to abdomen wall at one point of cicatrix near umbilicus. In the small intestine, twenty-eight inches from the pylorus, an anastomosis with the stomach.

The entire gastric wall, except the left third, extremely thickened and indurated. The finger could be forced through the pylorus. The inner surface of the stomach nodular with red and black discoloration. An anastomosis along the greater curvature of stomach one-third of the way from cardia.

Intestines, a few small tubercular ulcers and a large one in cæcum.

The stomach with the adherent intestine was removed entire and sent to Dr. John S. Ely, of the Pathological Department of the College of Physicians and Surgeons, who reported as follows:

"The specimens consist of the stomach, a small portion of the liver, part of the transverse colon and a loop of jejunum.

"The stomach is somewhat smaller than normal, measuring about twenty-three centimetres from fundus to pylorus. At its pyloric extremity is a mass (4.5 x 2.2 centimetres) occupying the wall of the organ and causing almost complete occlusion of the pyloric opening, which is now not more than two millimetres in diameter. This mass is abruptly limited at the gastro-duodenal junction, but is continuous in the opposite direction with an extensive infiltration of the stomach wall. This infiltration involves the entire gastric wall, with the exception of a more or less circular area at the fundus about five centimetres in diameter, but is not uniform in thickness over the whole of this extensive surface. The most considerable unevenness is near the pylorus, where two polypoid ingrowths (4.5 x 1.2 x 1.3 centimetres, and 2.8 x 1 x 0.7 centimetres respectively, the last number in each case representing its elevation above the mucous membrane), projecting from the posterior wall, must have acted to obstruct the passage of food from stomach to duodenum. Microscopical examination shows the growth at the pylorus and the infiltration of the wall of the stomach to be due to its involvement by colloid carcinoma. Near the middle of the greater curvature of the stomach, on its anterior surface is an opening (14 x 7 millimetres), somewhat pyriform in shape, through which the index finger may be passed into the lumen of the jejunum. The edges of this gastro-jejunal opening are involved in the general gastric infiltration above referred to, but no infiltration of the

jejunum itself below this point is discoverable. The loop of jejunum is firmly attached to the stomach by fibrous adhesions, in which a portion of the omentum seems also to be included. Behind this loop of jejunum is the transverse colon, the jejunum having been lifted at the operation over and in front of the colon. Firm adhesions with a portion of the colon to the anterior abdominal wall where it passes behind the cicatrix of the laparotomy."

The second case was one of malignant stricture of the sigmoid flexure for which I did a colo-rectostomy, also with success.

Thomas H. F., an Irishman, fifty-seven years of age, of good family and personal history, had formerly been a railroad engineer, but for the previous six years had worked at burnishing the soles of shoes. During this period he suffered from mild dyspeptic symptoms, which he attributed to the confinement and character of his work and to the poor quality of his meals. For the last six months his abdominal distress had been more marked, sometimes amounting to real pain, and much increased by the ingestion of food. There had been little or no impairment of appetite, never any vomiting, and but slight constipation.

On December 28, 1891, he had been forced to give up work on account of the almost constant pain and distention of the abdomen. Two days later he entered Bellevue Hospital. On account of the distention nothing abnormal could then be discovered. Repeated cathartics and all kinds of enemata failed to cause movements of any size, or to reduce the distention until about the end of January, when he had several large movements and the distention disappeared. Careful palpation then revealed a small, hard, movable nodule in the left iliac fossa. There had been at no time any continuous temperature, only occasional slight elevations above the normal. He remained out of bed quite comfortable until February 7, 1892, when the belly began again to swell and pain and constipation returned. No improvement taking place, he was referred to me by my medical colleague, Dr. W. B. James, with the diagnosis of chronic intestinal obstruction, probably from malignant disease.

After the usual preparation a median laparotomy below the umbilicus was performed on February 17, 1892, and, on exploration of the iliac fossa, a portion of the sigmoid flexure was found markedly constricted by a growth in its walls. The whole circumference of

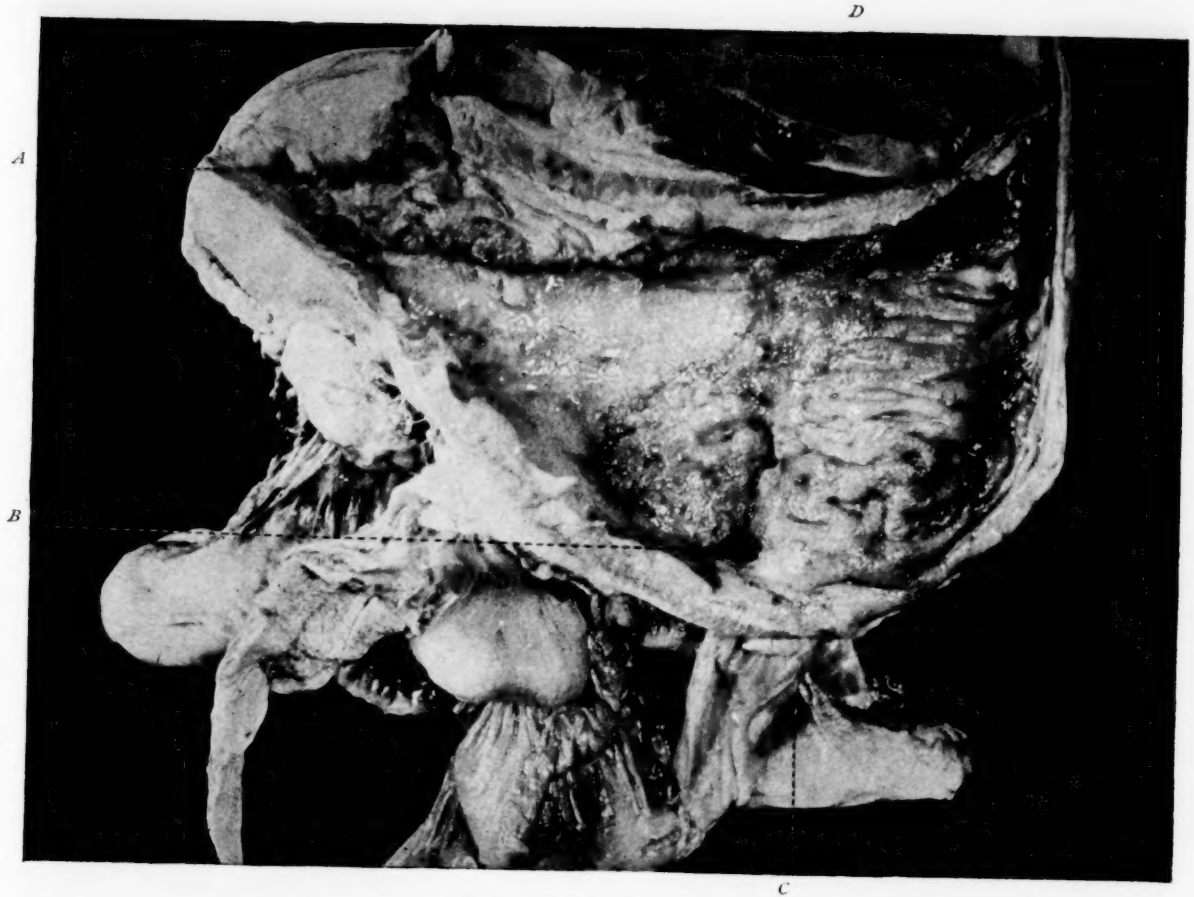

FIG. 1.—Remote Result of Gastro-jejunostomy.

A.—Pylorus. *B*—Anastomotic opening. *C.*—Jejunum. *D.*—Liver.

the gut was involved for about an inch, and as a result of this contraction the intestine above and below was distended.

As it was impossible to drag the diseased portion through the wound, and as the retroperitoneal glands were involved, I rejected excision and made an anastomosis between the bulging portions above and below the constriction. The technique of the operation differed in no respect from that of the last case, the opening having been nearly as large. The lines of sutures were reinforced by the neighboring appendices epiploicæ. At the end of the eighth day the wound was completely healed and all sutures removed. After two weeks he was allowed up and resumed regular diet. The bowels moved freely a few hours after the operation, and all distention permanently disappeared. There was no rise of temperature above 100.8° F., and that only on the day succeeding the operation. He soon returned to work, and from that time all his bodily functions were normally performed. Early in January, 1893, he began to lose flesh and strength, and gradually became weaker and weaker, dying on February 5, 1893, nearly a year after the operation, during which time he had no suffering except at the very last, when he complained of vague abdominal distress.

At the autopsy the abdomen was alone opened, and found to be the seat of a general cancerous peritonitis, there being deposits in nearly all the organs.

The specimen was removed entire and, as with the last, given to Dr. Ely.

The specimen consists of the sigmoid flexure of the colon, of two loops of small intestine and of a mass constituting the centre of the whole, and to which the portions of intestine above-mentioned are attached by firm adhesions. The dimensions of this mass, as nearly as can be determined, are 4.3 x 5.2 x 3.6 centimetres. Microscopical examination shows it to be large alveolar carcinoma.

At about the middle of the sigmoid flexure of the colon is the cicatrix of anastomosis.

Scattered here and there, over the peritoneal surface of the colon and in the mesentery, are small metastatic tumors of different sizes, up to six millimetres in diameter. These also show the structure of carcinoma.

A square window cut in the colon just above the line of cicatrix affords a view of the interior of the colon. Immediately opposite this window, *i.e.*, above the cicatrix, is a mass (3.7 x 3 x 1.3 centi-

metres) extending into the lumen of the colon, which is consequently narrowed to a very considerable extent. A little to the right of the centre of this mass, as seen from the window, is a small opening (6 x 4 millimetres) leading into the mass, and representing the original lumen of the colon, the degree of occlusion of which is represented by the diameters of this opening above given.

Below this mass, and visible both from the window and through the lumen of the colon from below (see Fig. 2), the artificial lumen of the gut at the point of anastomosis may be seen, corresponding in location with the cicatrix seen externally. This opening is somewhat crescentic in shape, its convexity being away from the neoplasm and toward the cicatrix. Its longest diameter is two centimetres, its shortest five and a half millimetres. The sharp convex edge of this crescentic opening marks the line of cicatrix, and measurement of the thickness of the cicatrix (from the edge of the artificial lumen to its peritoneal surface) may fairly be taken as representing the degree of contraction of the cicatrix at the point of operation. This is at most nine millimetres.

The two cases above reported may well serve not only to typify, but also to contrast malignant stenosis of the gastro-intestinal tract, at the two most frequent seats of invasion.

They markedly emphasize, too, the beneficial results of palliative operations in such cases as preclude the possibility of radical measures, and I must confess to a feeling of deep satisfaction at their end results since, with an absolutely fatal prognosis from the very beginning, increased length of days and, therefore, usefulness, with almost entire freedom from the suffering incidental to the disease, was granted in both instances until the end of life. At the present time a sharp distinction must always be drawn between radical and palliative procedures for malignant disease, and the latter only be considered when the former are of necessity inadmissible.

Gastric and intestinal cancer pursue a somewhat different course, and present, in some respects, entirely dissimilar symptoms. Thus in the former, to the final cachexia of the disease, is early added an intense anæmia with emaciation, which, in itself, determines a comparatively rapid termination, with great suffering from pain and vomiting, while in the case of the latter, trifling

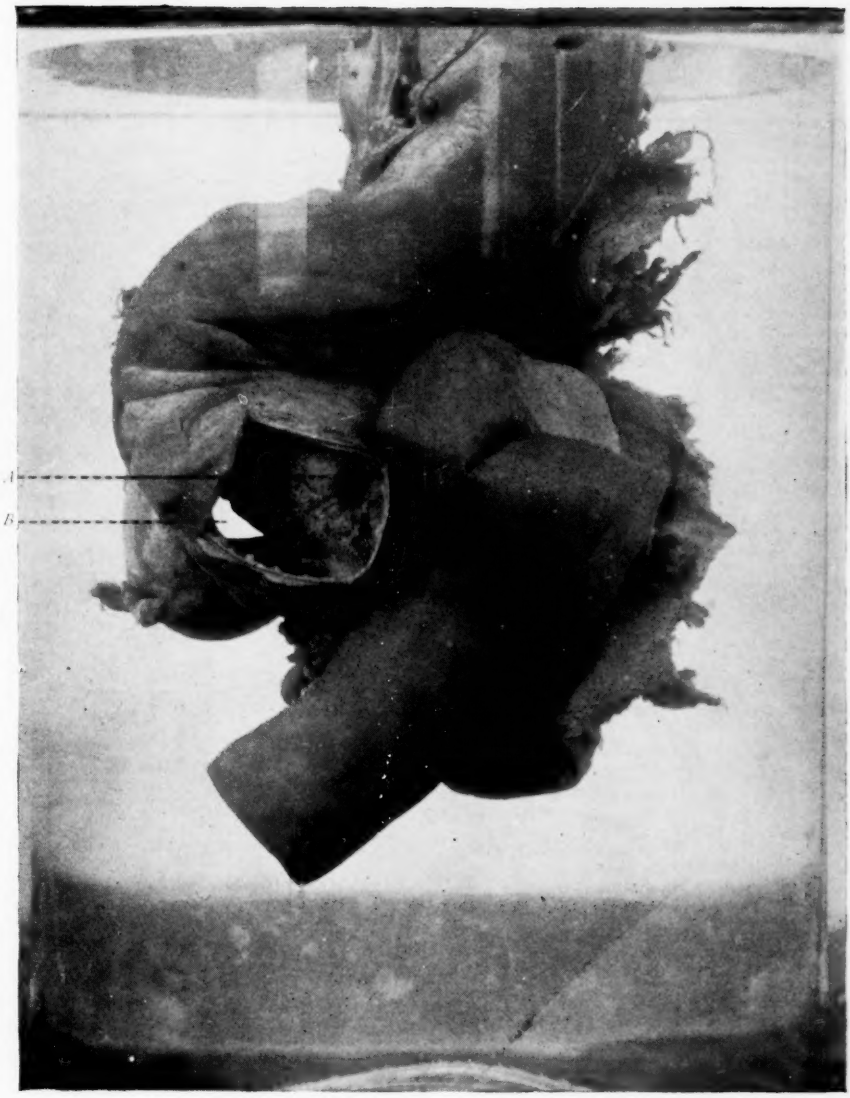

FIG. 2.—Remote Result of Entero-anastomosis.

A.—Opening through stricture. *B.*—Anastomotic opening.

constitutional disturbance with slow progress is the rule until death occurs either from acute obstruction or exhaustion due to extension of the disease and general systemic involvement.

The conditions of the palliative operative measures also vary, depending on whether to the purely mechanical obstruction grave interference with digestion and assimilation is added. Thus when the disease is located in the upper portion of the tract, patency of the canal must be restored with a minimum of digestive exclusion, while in the lower portion comparatively large areas may be excluded without detriment to health.

The restoration of patency is common to all situations, and the object of the paper is not to review the various methods which have been adopted for that purpose, but to again call attention to certain facts which seem to have been overlooked, or at least placed in the background by many of the most prominent writers on the subject of anastomosis for obstructive malignant gastric disease.

In order to do this to best advantage a concise review of the salient features of the disease seems profitable, together with a statement of the manner in which its presence interferes with normal functions, the results of such interference, and the logical indications for treatment as deduced from these considerations. In all that follows, originality of thought or expression is utterly disclaimed, and the works of all authors bearing upon the subject have been freely appropriated for the purpose above stated.

As to frequency, statistics show that about two-fifths (40 per cent.) of all cancers attack the stomach. This situation being, next to the uterus, the most frequent seat of primary growth (Osler), 21.4 per cent. in a total of 30,000 cases (Welch).

It originates here invariably in the mucous layer. Starting from the glandular epithelium it rapidly extends through the muscularis mucosæ to the submucous coat, and is often associated with considerable hypertrophy and thickening of the neighboring connective and muscular tissues (Strümpfel).

It progresses, as a rule, slowly at first, showing little tendency to infiltrate the neighboring structures until fairly well advanced, and, when situated at either orifice, often causes death

by mechanical obstruction before its victim is overtaken by general exhaustion [illegible].

According to Delafield and Prudden the new growth usually follows one or another of three types.

(1) A circumscribed flat tumor whose mucous surface necroses to a greater or less degree, leaving varying-sized ulcers, which may or may not perforate the wall.

(2) Tumors, often of large size, which project into the gastric cavity.

(3) A diffuse flat infiltration of variable extent, which does not ulcerate and hardly forms a tumor.

These different types may exist alone or in combination.

Heredity has a slight but undeniable influence in its causation (Strümpfel), and there is sometimes a very probable connection with antecedent ulcer (Hauser).

It is about equally distributed between the two sexes, the male, if anything, being favored, and occurs, in the majority of cases, between the fortieth and seventieth year, the maximum liability being between fifty and sixty, and it being rare before thirty.

Its average duration is from six to fifteen months, and it proves fatal in the majority of cases within two years.

In a little over one-half the cases (three-fifths, Welch) the disease is located in the pylorus, and of these only one-half present conditions favorable for a radical operation (Bull).

There is a tumor in 80 per cent. (Brinton-Lebert), pain in 90 per cent., and vomiting, as a rule, when the orifices are involved.

Metastases are frequent (one-fourth), usually in glands and liver.

It is a disease obscure in its symptoms, frequent in its recurrence, fatal in its event (Brinton), the course of which, as a rule, is progressive, irresistible and advancing toward a fatal termination (Ewald).

Most of the cases exhibit a combination of grave digestive disturbances, with a relatively rapid loss of flesh and strength (Strümpfel), but it assumes many curious clinical features (Welch).

In the normal stomach, normal relations exist between pyloric resistance, contractility and contents (Osler), and in certain forms of disease the requisite relationship may be preserved by compensation, in spite of abnormal change of the individual factors (Ewald). As a rule, however, injury to one involves the others.

In pyloric cancer the resulting gastrectasis depends not only upon the degree of pyloric stenosis, but, secondarily, upon the atonicity of the muscularis from chronic catarrh with atrophy of the glandular elements, and upon the inhibition of the motor nerve fibres by elements of decomposition (paralytic dilatation).

Exceptionally, however, circumscribed cancerous infiltration and ulcerations, which do not cause stenosis but destroy a portion of the gastric muscle, result therefrom if their growth be slow enough, in hypertrophic dilatation by interference with normal peristalsis. On the other hand, pyloric stenosis of marked degree *may* exist without dilatation.[1]

The pyloric stenosis can be produced as well by an ingrowth of the tumor, acting or not in a valve-like manner, as from the inability of the hypertrophied and thickened muscularis to contract, and may be intensified by distortion due to the weight of the tumor (Glénard).

Because of the glandular atrophy there is an *impairment of the secreting function*, and, finally, according to Riegel, the gastric juice entirely loses the digestive property (v. Jaksch). With the stagnation of stomach contents *absorption is seriously* disturbed, and from the delay in removal, and, therefore, formation of absorbable substances, *paresis of the motor elements* from products of decomposition, still further favors stagnation, there being little or no hydrochloric acid present "to maintain the ingesta in a state of asepticity." No more vicious circle can be imagined.

[1] Report from Heidelberg clinic by Czerny and Rindfleisch. "A case of small cell alveolar, carcinomatous infiltration, which extended throughout the submucosa like the carcinoma lenticulare mammæ and presented dilatation of the stomach." ANNALS OF SURGERY, Vol. 17, p. 735.

Von der Velden was the first to note that, in most cases of cancer, the gastric juice had comparatively feeble digestive power, and contained no free hydrochloric acid, and Riegel discovered that even normal gastric juice had its digestive powers weakened if the secretion of a cancerous stomach was added to it.

In the rare cases of cancer in which the secretion of hydrochloric acid has persisted until death, the mucous membrane has been found normal, except in the immediate locality of the cancer, so that its presence "points with very great probability against the existence of cancer," for, "in the majority of cases, its formation is entirely suppressed." As the disease progresses nutrition becomes more and more impaired, until a highly-marked marasmus appears, a cachexia with progressive anæmia and wasting, which, in the character of its blood changes, closely resembles that of pernicious anæmia, a disease associated with similar atrophic gastric conditions.

We know that of the food, ultimately oxidized in the body to its end products, only a small portion serves the purpose of tissue reconstruction, the larger being used to generate the heat requisite for the maintenance of life (Einhorn).

Now, it has been shown by Von Noorden and others that emaciation in chronic diseases of the stomach is caused, in the vast majority of cases, if not in all, not by specific poisons circulating in the organism, but by starvation (the digestion and assimilation of too little food to replace tissue waste), and again it has been experimentally (Ogata), as well as clinically, proven (Leube-Ewald) that, in grave disturbances of the digestive functions of the stomach, the intestine can vicariously perform the work in a complete manner. For example, in cases of atrophy of the mucous membrane in which the gastric secretion has entirely ceased, patients can, under a proper regimen, maintain their usual weight, and, in fact, often gain and live long without any discomfort whatever (Einhorn).

There is not at present any operation which can ensure the cure of cancer of the stomach (Guinard), and, while it is difficult to arrive at the position of palliative operations (Barker), it may

still be said to have been clearly shown that a fistulous communication between the stomach and bowel may be established *even in very debilitated subjects*, without great risk to life (Paul), and although it does not cure, it affords relief from the torments of starvation, and incessant vomiting, and, with these benefits, the prolongation of life (Page).

It is difficult to understand how, with a full appreciation of the principles above stated, the selection of the intestinal loop could then be left to chance, as advised by Luecke and others, a definite method being imperative to ensure success. Those who seek for a fixed point, the plica duodeno-jejunalis, as a means of identification, are the most certain and scientific (Hahn, Jessett, etc.).

It seems to me that the purpose of the operation has been thus clearly outlined in the data which I have above superficially sketched, and I believe that at the present time improved surgical technique, with the knowledge gained by experience, warrants, on the part of the surgeon, an offer, to those suffering from this incurable disease (*the most* distressing symptoms of which depend largely on *remediable* conditions), of relief, from unnecessary suffering with extension of life, at a comparatively little proportionate risk.

As a result of experience we endeavor to operate as early in the disease as possible, or, if debility is already present, postpone interference until, by means of systematic lavage with careful gastric, supplemented by rectal, nourishment, the general condition improves.

We have also learned:

(1) That the size of the anastomotic opening must be large on account of the tendency to contraction.

(2) That in case of the stomach it should be as near as possible to the greater curvature and nearer the fundus than the pylorus, so as to be not only as far distant as possible from the disease, but, at the same time, in the most favorable situation for the passage of the contents of the stomach into the intestine.

(3) That the jejunum, about thirty inches from the pylorus, is the proper portion of the intestine to approximate, and that

its opening should be placed midway between mesenteric attachment and extreme convexity.

(4) That in the approximation the loop must be so arranged that its peristaltic wave corresponds with that of the stomach.

(5) That the tide of opinion seems to favor a union which shall represent, as far as possible, that of the different anatomical layers the ideal operation), rather than through the medium of artificial aids (Wölfler, Halsted, Barker, Abbe).

6) That as in all intra-abdominal operations our manipulations must be so performed as to favor to the slightest degree ultimate adhesions between adjacent structures.

In originating the operation, Wölfler prophesied its present extended application when he said, " Perhaps a further experience will show that this kind of entero-plasty will, not only in carcinoma of the stomach, but also of the intestine, be able to replace the formation of an intestinal fistula " (external).

A CASE OF EMPHYSEMATOUS GANGRENE OF THE HAND DUE TO THE STREPTOCOCCUS PYOGENES AND THE BACILLUS ÆROGENES CAPSULATUS: RECOVERY WITHOUT AMPUTATION.[1]

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Case.—William Richter presented himself the first time July 24, 1893, at the Dispensary of the University of Maryland with the following history and symptoms: Age, forty-seven years; native of Marburg, Germany; has been living in the United States since 1866; occupation, hydraulic engineer; gives a good family history, never had any specific disease: last sickness, twenty years ago, was typhoid fever.

He noticed a small black blister, on the palmar surface and near the end of the ring finger of the left hand, on the evening of July 14, 1893, which remained stationary for about one week, after which time his hand commenced to swell, got red and became very painful. He had a chill, which was followed by marked sweating, and severe pain, which extended over the hand and forearm, preventing the patient from sleeping the night before he presented himself for treatment.

Condition upon admission was as follows:

His third finger was very much swollen, red and very painful; the redness and swelling extending over the entire dorsal surface of the hand; he had a most marked lymphatic involvement of the arm; the lymphatics standing out like stiff, red cords; Sigmund's gland and those in the axilla were swollen and painful; his temperature was 102.5°, pulse 110; had severe cephalalgia and was constipated.

No history of injury could be gotten. Diagnosis of cellulitis

[1] Read before the Medical Society of the University of Maryland, December 5, 1893.

and lymphangitis was made. Two incisions in finger and one in dorsum of hand were made by Professor Tiffany. A wet corrosive sublimate dressing, 1 to 5000, was applied. He was given some Rochelle salts and tincture of iron and instructed to report the next day.

July 25. Hand feeling comfortable; had a good night's sleep; temperature 99.2°, pulse 100; owing to the marked improvement the dressing was not removed.

July 26. Hand very painful, had been unable to sleep during the night; the dressing was changed by one of the clinical assistants, who noticed that the hand was more swollen and very tender upon pressure. The hand was re-dressed with wet corrosive sublimate gauze, 1 to 5000.

July 27. At 1 P.M. I was sent for to see the man, who presented the following symptoms:

He complained of great pain in the hand and arm, and was unable to sleep during the night. He had had two chills, one at 3 the other at 5 A.M., which were followed by much sweating; temperature was now 105.5°, pulse 130. Examination of the hand showed it to be much swollen and œdematous; end of third finger was green and without sensation; two small bullæ, which contained a bloody, offensive fluid, were on dorsum of the hand. The incisions which had been made on the 24th were covered with a yellowish green slough; the swelling extended half way up the forearm; the lymphatics in the arm were more marked than before; Sigmund's gland and those in the axilla were also more swollen and painful.

Upon pressure a very distinct and extensive emphysematous crackling could be felt over the dorsum of the hand, extending nearly as high as the wrist-joint.

The diagnosis of acute emphysematous gangrene was made.

The man was informed of the serious nature of his trouble, and that an amputation might be necessary, to which he consented, but which was objected to by his wife. However, the patient was etherized and long free incisions with sterilized instruments were made quite through the emphysematous tissue, going through the deep fascia and exposing the deep structures.

The flexor tendons of the third finger were green and soft as high as the metacarpo-phalangeal articulation. They were excised. His hand was then put into a very hot corrosive sublimate bath, 1 to 1000, and watched; the hot solution was changed every twenty minutes. After the incisions were made and before any antiseptic

substance had come into contact with the wounds six culture tubes were inoculated; three Esmarch gelatin and three stab agar agar, the latter tubes being half full of agar.

The patient reacted very slowly from the anæsthetic, being unconscious for several hours. Three and a half hours later the end of the third finger was cut off with scissors, causing no pain to the patient. Crackling at this time was about the same; temperature 105.2°, pulse 126, and very weak.

About six hours after the operation both the patient and his wife requested an amputation. Everything was gotten in readiness, but upon examination the emphysema had distinctly diminished in extent; temperature was 104°, pulse 110. It was decided not to amputate immediately, but wait and watch the progress of the disease.

12.30 A.M., about nine hours after the incisions were made, the crackling was decidedly less, although the hand was much more swollen. The wounds which I made were covered with a yellowish slough; temperature 103° F., pulse 110; patient passed three ounces of urine, which contained albumin, casts and red blood corpuscles; his hand and arm were kept constantly in the hot corrosive sublimate bath.

July 28, 7.30 A.M. Crackling could now be felt only over quite a small surface on dorsum of hand; other local symptoms were about the same; temperature 102.2°, pulse 105.

10.30 A.M. Professor Tiffany saw the patient with me. He found crackling over small surface on the back of the hand, which was very much swollen and œdematous; lymphangitis not so marked; the hot corrosive sublimate bath was continued.

The crackling was felt for the last time at 12.30 P.M. The patient improved rapidly from that time; his temperature at 8 P.M. was 103°, pulse 105; they never reached such high points afterwards.

The hand and arm were kept constantly in the bichloride bath for five days; the sloughs separated on the third day, leaving large irregular wounds which healed very slowly. On the sixth day the corrosive sublimate bath was discontinued and a bichloride gauze dressing applied. Now, three months having elapsed since his sickness, he still has some albumin and casts in his urine. The wounds have healed, but have left the hand quite stiff; it is, however, gradually getting more motion.

The only medicines which the patient got were whiskey, infus. digitalis, hypodermic strychnine, and, later, iron.

BACTERIOLOGICAL EXAMINATION.

The six culture tubes which were inoculated from the blood that came from the gangrenous tissue at the time when the incisions were made give the following results:

Esmarch Gelatin Cultures.—The gelatin was liquefied and kept fluid at a temperature of 30° C.; a drop of the blood was taken on a sterilized platinum loop and mixed well with the gelatin in one of the tubes; from the first tube the other two tubes were inoculated; they were then rolled on ice and kept at room temperature; as the weather was warm (20° to 23° C.) it was not necessary to put them into a thermostat. There was no visible growth present at the end of twenty-four hours; at the end of forty-eight hours, however, there was an abundant growth in all the tubes; tubes No. 1 and No. 2 being diffusely cloudy, and No. 3 containing small, pale, grayish colonies; no liquefaction. Examination of these gelatin cultures showed them to be pure cultures of the streptococcus pyogenes; no other organism being present. They grew in very long chains, in some instances reaching across several fields of the microscope; as these tubes remained a pure culture of the streptococcus pyogenes, I shall not refer to them again.

Nutrient Agar Agar.—The tubes, as already mentioned, were filled about half full of agar agar and boiled so as to displace the oxygen, which was present in the medium, as it was suspected that an anærobic organism might be present in the tissues. They were inoculated by making a deep stab with a long, straight platinum needle, which was sterilized; it contained a small amount of blood from the wounds. The inoculations were made at just about the time when the agar agar commenced to get hard, so that when the needle was withdrawn the line of puncture would close and thus exclude the oxygen. These cultures were also kept at room temperature, which was warm (20° to 23° C.).

In twenty-four hours they contained a distinct growth along the line of puncture in the lower two-thirds of the culture, no growth being present in the upper one-third; the growth was of a whitish color, and formed of small round colonies, with irregular contours. There were two small gas bubbles present in the lower portion of the culture.

Forty-eight hours. The growth now extended along the entire line of inoculation, coming quite to the surface. The colonies in the lower portion of the tube were much larger and darker, being

quite different from the ones in the upper portion. There were a number of air bubbles throughout the lower third of the culture. They contained a fluid which was opaque.

Microscopical examination of some of the culture from near the surface showed it to consist of streptococci, which were identical with the organisms that were found in the gelatin culture.

One of the tubes was broken on a sterilized dish, and the growth from the lower portion examined under the microscope, which showed it to consist of a bacillus somewhat shorter than the anthrax bacillus, and having slightly rounded ends. It stained deeply with Gentian violet.

Now, seeing that I had a mixed culture present, and that one of the organisms was probably an anærobic bacillus, I made two sets of Esmarch agar agar cultures from a portion of the growth in the lower part of the broken tube, also two stab cultures. The cultures were made anærobic, according to the method of Buchner.[1] At the end of twenty-four hours I had quite a distinct growth in all the tubes.

Esmarch Tubes.—Colonies were numerous, small, whitish color, more or less round, with irregular contours and having a dark centre.

Forty-eight hours. Upon examination it was found that two distinct and different kinds of colonies were present, the one being much larger than the other. The smaller colonies were found to be the streptococcus pyogenes, the larger ones the bacillus. The colonies of the bacilli were round with irregular contours, with little projections from all around their edges that gave to them a bristly appearance. They had a dark central spot; the colonies of the two different organisms could be easily identified. I will not describe the streptococci colonies, as there was no difficulty in recognizing the organism.

Stab Cultures.—Twenty-four hours. A distinct growth was present along the entire line of puncture; the growth was of a whitish brown color. Numerous gas bubbles were disseminated through the medium; the bubbles contained an opaque fluid.

Forty-eight hours. Examination of the cultures showed them to be mixed, containing both the bacillus and the streptococcus; these cultures were, therefore, not further used.

Two stab tubes of gelatin and two stab tubes of agar agar were inoculated from the single colonies of the bacillus on the agar agar roll; one tube of each medium contained sugar, the other two being

[1] Centralblatt für Bakteriologie, 1888, Band IV, p. 149.

plain. Two tubes of sugar bouillon were also inoculated at the same time from the same colonies; they were all put into Buchner's jars, except one of the bouillon, which remained exposed to the air. At the end of twenty-four hours all the anærobic cultures contained an abundant growth.

Agar Agar and Gelatin Cultures.—The growth extended along the entire length of the line of puncture, and was of a whitish brown color. The colonies near the surface could be seen to be identical with those from which the inoculation was made; numerous gas bubbles were present throughout the media, they contained an opaque fluid; also an opaque fluid accumulated on the surface of the culture; the growth was more pronounced in the tubes that contained the sugar than in the others.

Forty-eight hours. Growth much more marked. In the agar agar tube that contained sugar; the medium was split into two parts and separated about one-eighth of an inch; in the crack a cloudy fluid had accumulated. In the gelatin tube the growth seemed to sink to the bottom along the line of inoculation, due to a softening, although the gelatin was not liquefied; there were more gas bubbles in the gelatin than in the agar agar tubes.

Anærobic Bouillon Culture.—Twenty-four hours. The bouillon was quite opaque, having small particles suspended and a thick whitish sediment. The surface was covered with a foam, showing that considerable gas formation was taking place in the tube.

Forty-eight hours. The culture by this time had become clear, having a thick whitish sediment that was quite tenacious; there was not quite so much foam on the surface as the day before. The bouillon culture that was exposed to the air remained clear, having no growth.

Microscopical examination of the anærobic bouillon culture showed it to be a pure culture of a long bacillus, which stained very easily with gentian violet and methylene blue. Some of the organisms were not uniformly stained, but had a granular appearance. The bacillus was a little shorter than the anthrax bacillus; it did not grow in chains, was mostly single or in irregular clumps, but sometimes two or more were joined together, end to end. The bacillus was usually straight, although some were bent, resembling somewhat the tubercle bacillus; the ends were not cut square, but slightly rounded; no spores were observed in any of the organisms; spore stains were used, but with negative results.

There could be seen a clear zone surrounding most of the

bacilli, which was demonstrated to be a thick capsule by treating the organism with strong acetic acid, and replacing the acid with an aqueous solution of gentian violet, after the method of Welch. Drop cultures showed it to be non-motile. The bacillus was strictly anærobic, not growing in the presence of oxygen and a non-liquefier of gelatin.

Remarks.

The bacillus that was isolated from the above case is identical in all particulars with the bacillus ærogenes capsulatus of Welch and Nuttall,[1] who first discovered it in the blood and tissues of a man who died from the rupture of a large thoracic aneurism; extensive emphysema was found all through the blood and tissues a few hours after death. The formation of gas was so extensive that large bubbles were present in the veins; when these bubbles of gas were lighted they would burn with a slight explosion, showing they were not atmospheric air.

Cover-slip preparations of the blood and tissues were examined which showed the presence of large numbers of bacilli that subsequently proved to be the cause of the emphysema. Cultures were made and studied which correspond exactly with those that I have described.

Inoculation experiments on rabbits showed that large doses could be injected into the circulation without any severe symptoms following; but if the animal was killed shortly after the inoculation, rapid and extensive emphysema would develop throughout the tissue. In no instance did the growth take place before the death of the animal. One pregnant rabbit, however, died, and developed rapid post-mortem emphysema.

At the time when Professor Welch discovered the bacillus ærogenes capsulatus I was working in his laboratory, under his personal supervision, and did special work with the organism at that time, and had frequent opportunities in assisting him in his experiments, which training enabled me to identify the bacillus ærogenes capsulatus with certainty.

Eugene Frænkel[2] reported later several fatal cases of

[1] Bulletin, Johns Hopkins Hospital, Vol. III, p. 81.

[2] Centralblatt f. Bakteriologie, Band XIII, p. 1.

emphysematous phlegmons which followed hypodermic needle punctures. He made a bacteriological examination and found a bacillus which he called bacillus phlegmonis emphysematosa, which is identical with the bacillus ærogenes capsulatus of Welch and Nuttall. P. Ernst[1] and Graham, Steward and Baldwin[2] have recently reported the presence of the same bacillus in cases of abortion with rapid post-mortem development of gas in the blood-vessels.

These few cases are sufficient to prove that under some favorable circumstances the bacillus may grow in the living tissues, and cause death by a rapid progressive septicæmia.

The case which I report proves that the bacillus ærogenes capsulatus may develop locally in the tissues during life and in association with pyogenic cocci produce emphysematous necrotic inflammation, and that recovery may take place without general penetration of gas into the vessels, at least in sufficient amount to be demonstrable.

The case shows several interesting things, viz., that the bacillus does grow in the living body, causing great destruction both locally and constitutionally, the infection remaining local and ending in recovery without the removal of the diseased part. Such cases are, however, extremely rare, usually ending in death regardless of what measures are taken. It also carries out the suggestion of Frænkel that sometimes life may be saved without an amputation. The most favorable cases for such treatment are those where the gangrene starts in a finger or a toe. In these cases the surgeon has time to wait a short while, and amputate if the disease advances. It is the only thing that can be tried in cases where the trouble starts in the trunk.

Knowing that the bacillus which causes the disease cannot live in the presence of oxygen, Frænkel suggested that the parts be freely incised so as to admit the access of air to the diseased tissue, and at the same time apply some oxidizing agents as permanganate of potash or $H_2 O_2$, etc. In my case I depended upon the powerful antiseptic properties of corrosive sublimate with the most happy result.

[1] Virchow's Archiv, Band CXXXIII, p. 308.
[2] Columbus Medical Journal, August, 1893.

In concluding, I beg to call attention to the fact that the patient was found to have albumin casts and blood in his urine a few hours after the operation, which are also in his urine at the present time. This strongly suggests that the patient had some organic changes in his kidneys before the time of his infection, which may have predisposed him to this disease.

From the fact that he had a mixed infection of the streptococcus pyogenes and the bacillus ærogenes capsulatus, it is impossible to say to what extent the disease was due to one or the other of the organisms.

The formation of the gas must be entirely due to the bacillus. The mixed infection may also have been the cause of the disease remaining local, as the growth of one of the organisms may have prevented the growth of the other to a certain extent and thus localized the trouble.

Perhaps it might be well to say here that the bacillus of malignant œdema is quite different and distinct from the bacillus ærogenes capsulatus.

The bacillus of malignant œdema was first discovered by Pasteur[1] among his "septicémie," and described as "vibron septique."

Several years later Koch[2] found the same bacillus in the human body, and called it the bacillus of malignant œdema. See also Gaffky.[3]

The bacillus of malignant œdema is widely distributed throughout nature, being found quite often in garden earth, and also in dead animal bodies, where putrefaction with the formation of gas is present, and in emphysematous gangrene.

Clinically, I do not think a differential diagnosis can be made between an infection with the bacillus of malignant œdema and the bacillus ærogenes capsulatus without a bacteriological examination, as the pathological lesions are quite the same in both infections; the general symptoms in both are those of a profound, rapid, progressive septic poisoning.

All the cases that are reported, due to infection with the

[1] Bull. de l'Acad. de Méd., 1877–1881.
[2] Mitth. aus dem Ges-Amt., I, s. 54.
[3] Ibid, s. 88.

bacillus ærogenes capsulatus, have died. The true nature of the infection was recognized post-mortem.

The case which is reported in this paper is the only recorded one that ended in recovery and the nature of the infection ascertained during life.

The symptoms in the above case were in no way distinguishable from those of malignant œdema infection. The differential diagnosis can, however, always be made by a carefully conducted bacteriological examination.

I place in parallel columns the characteristics and differences betweèn the two bacilli, thus showing at a glance they are quite unlike:

Bacillus of Malignant Œdema.	Bacillus Ærogenes Capsulatus.
Grouping. Often in pairs, joined together end to end, also often in long chains.	*Grouping.* Single or in irregular clumps, seldom in chains of more than three or four.
Mobility. Very motile.	*Mobility.* Absolutely non-motile.
Spore Formation. Rapid development of large spores.	*Spore Formation.* No spores.
Behavior in Gelatin. Rapid and extensive liquefaction.	*Behavior in Gelatin.* No liquefaction, only a slight softening.
Staining. Special staining shows many large spores.	*Staining.* Special staining shows no spores.
Capsule. Demonstrable.	*Capsule.* Very distinct and thick.
Pathogenesis. Inoculation experiments on animals always cause death a few hours to a day or so.	*Pathogenesis.* Inoculation experiments on animals are often negative, often no growth takes place before the animal has been killed from some other cause, after which rapid post-mortem development takes place. (See Welch's experiments, Bulletin Johns Hopkins Hospital.)

GANGRENOUS CHOLECYSTITIS.[1]

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ALTHOUGH many cases of inflammation of the gall-bladder, with secondary peritonitis, have been reported in recent years, I feel that no apology is necessary for putting on record the follow history. Incomplete as the record is in many important details, it furnishes certain features, pathological and clinical, which are interesting and suggestive:

Carl R., aged nineteen, German, a painter by occupation, was admitted to the First Medical Division of Bellevue Hospital on the evening of June 9, 1893, complaining of very severe abdominal pain, which had developed quite suddenly about six hours before. His previous history was negative. He had had acute articular rheumatism some two months before, but never remembered any similar attack of abdominal pain. There was no history of biliary colic.

On admission he was apparently suffering intensely. His abdomen was hard, tense and tender on pressure all over the right side, but especially so at a point corresponding to the situation of the base of the appendix vermiformis. No tumor could be felt in this situation, however, but there was a fullness in the region of the upper segment of the right rectus muscle which extended to the umbilicus. Thinking the case one of acute appendicitis, it was referred to the surgeons.

Seeing the case some two hours later, the previously described conditions were verified. It was not easy at this time to determine clearly the nature of the tumor in the region of the navel, as it simulated closely a spasmodic contraction of the rectus. The whole right side of the abdomen was so tender that a careful examination

[1] Read before the N. Y. Surgical Society, November 22, 1893.

was impossible, and there was sufficient tympanites present to preclude the possibility of determining accurately the relations of the tumor to the liver. There was at this time no vomiting. The bowels had moved naturally a few hours before, and the patient's general condition seemed fairly good. It was decided, in view of this, to wait until morning for further developments. The temperature at this time was 104° F.; pulse, 126; respiration, 36. A cathartic was ordered, and a small amount of morphia given to keep him comfortable.

June 10. The temperature continued elevated throughout the night, ranging between 104.2° and 103.6° F. Vomiting began shortly after midnight, and persisted at frequent intervals thereafter. About noon he was again examined, and the conditions of the previous night found still to persist. The abdomen was now slightly more tympanitic, and generally tender on pressure, though the greatest tenderness was still limited to the right side and to a point corresponding to the base of the appendix. There was marked restriction to the respiratory movements of the right side of the abdomen, and the right thigh was flexed. The expression of the face was anxious. The pulse was rapid and rather feeble, and the vomiting very frequent.

A laparotomy was decided upon, and the patient was transferred to the surgical wards, where the operation was done two hours later. Having carefully washed out the stomach, ether was administered. Under the influence of the anæsthetic, a more careful examination was made. No tumor was felt over the region of the appendix; but the swelling previously described in the upper segment of the right rectus muscle was made out as clearly intra-abdominal, though even at this time its connection with the liver was not determined. The possibility of this tumor being distended gall-bladder was considered, but on account of the patient's youth only as a remotely possible cause of the peritonitis.

An incision about four inches in length was made at the outer border of the right rectus, with its centre near the umbilicus. The appendix was at once sought for and quickly brought into the wound. It was apparently free from disease and normal in appearance, except for the bright red injection of the vessels in its peritoneal coat. On lifting up the cæcum a very small quantity of thin pus came into view, which had evidently run down along the outer layer of the meso-colon. This was quickly taken up with sponges, the rest of the

peritoneal cavity having been carefully protected. A further search in this region revealed no other collections of pus, but the intestines were very brightly injected. There were no adhesions. Presenting at the upper angle of the wound was a large tumor of purplish hue, apparently very tense and markedly congested. The incision was prolonged up to the free border of the ribs, and the tumor well exposed. An aspiration needle introduced into it withdrew about a drachm of somewhat thin, sticky fluid, of a yellowish brown color, which had the appearance of bile. The tension having been relieved, calculi could be easily felt through the lower end of the tumor, which was clearly a distended gall-bladder. It was apparently about five inches long, and appeared to be nearly as large around at its neck as at the fundus, which measured about two inches in diameter.

The lower end of the gall-bladder was almost black, its walls exceedingly thin and apparently gangrenous.

The peritoneum covering the entire tumor, together with that of the adjoining intestines, was intensely congested, and in places covered with patches of recent lymph. In some of these patches minute collections of pus were found. These areas having been carefully mopped out with Thiersch's solution, the parietal peritoneum was stitched to the edges of the wound in its upper third. The gall-bladder was then aspirated of its fluid contents, *i.e.*, to the extent of about three drachms, and the tension having been relieved, an attempt was made to stitch it into the wound. This procedure had to be abandoned, as the walls of the fundus were so soft, thin and friable that the sutures immediately tore out.

The lower part of the abdominal incision was then closed, and the upper part stuffed with iodoform gauze, by means of which the gall-bladder was packed securely into the upper part of the wound. The dressings were then applied, as it was not deemed advisable, under the circumstances, to open the gall-bladder at once.

The patient's condition at the close of the operation was bad. He soon rallied, however, from the anæsthetic, but began rapidly to sink. Vomiting continued; the temperature steadily increased until about an hour before his death, when it reached 109°. Death occurred about seven hours after the operation, or about thirty hours from the onset of the attack.

Autopsy.—At the autopsy made the following day, *i.e.*, within twenty-four hours, the following conditions were found:

Lungs.—Congested and œdematous, otherwise normal.

Heart.—Normal in size. Mitral and semilunar valves covered with vegetations and thickened.

Spleen.—Congested, but not especially enlarged, and apparently normal.

Kidneys.—Capsules slightly adherent; markings somewhat indistinct.

Liver.—Normal in size. No abscesses found.

Intestines.—Congested and covered in parts with patches of recent lymph as described. No further pus foci found; no organized adhesions. On opening the duodenum the common bile duct was found to be pervious, and bile could be squeezed through from the gall-bladder.

Gall-bladder.—Greatly enlarged. It measured about five inches in length, and had a nearly uniform diameter of about two inches, though it was slightly larger at the fundus than at the attached portion. It contained about twenty calculi, each as large as a good sized hazelnut, and all facetted. The mucous membrane was deeply bile-stained, and there was a little bile-stained fluid remaining in the sac. One of the largest of the stones rested over the opening of the cystic duct. The walls of the body and neck were enormously thickened, measuring at this time fully three-eighths of an inch. The walls at the fundus, on the other hand, were very thin, soft, friable and gangrenous.

No perforation could be demonstrated by fluid pressure within the bladder.

The interior of the bladder presented a remarkable condition, in that it was almost completely divided by a thick transverse septum, which was found about one and one-half inches from the end of the fundus. This septum was complete, except for a small aperture about one-fourth of an inch in diameter near its centre. The appearance of this curious partition gave rise to the question as to whether it really was a true septum or whether the apparent cavity of the fundus might not be a diverticulum. With a view to determining this point, sections were made through the septum and through the thin walls. Mucous membrane was found absent in both sections, but the muscularis, though thinner than elsewhere, and with its bundles spread apart, was found continuous with that of the gall-bladder. This proved the lower gangrenous end of the tumor to be fundus of the gall-bladder, and not a diverticulum. The walls of the gall-bladder, as shown in both sections, but especially the walls of the middle

portion, were found infiltrated with fibrin and pus. The amount of this fibrinous exudate was so great as to easily account for the great thickness of the walls of the gall-bladder, and quite sufficient to determine gangrene of the fundus.

I am indebted to Dr. T. Mitchell Prudden for the careful examination of the sections. A microscopical examination of the fluid, withdrawn by aspiration at the time of the operation, was practically negative. A mass of débris, a few red blood cells and numerous cholesterin crystals were found. No pus cells were found at that time, but were probably overlooked in the hasty examination, as they can now be shown on the inner free surface of the section taken from walls of the gall-bladder. No cultures were made.

In an imperfect and somewhat hasty review of the recent literature of cholelithiasis, I have been unable to find the record of an exactly similar case.

Although gall-stones have been found in the bodies of new-born infants by Portal[1] and Lieutaud, their occurrence before the age of twenty is exceedingly uncommon. Their frequency in the dead subject varies within pretty wide limits in different sets of statistics. Thus, Peters, of Kiel, found them in 5 per cent. of all his autopsies, and Schroeder, of Strassburg, in 12 per cent. According to the tables of Schroeder, out of eighty-two sections made in persons under twenty years of age only two, or 2.4 per cent., were found to have gall-stones. The case reported here to-night is remarkable, in that a condition of cholelithiasis, with such advanced hypertrophic changes in the walls of the gall-bladder as usually accompany a case of long standing, should be found in a boy of nineteen. That no history could be obtained pointing to any previous biliary troubles only confirms the repeated observation of pathologists and good clinical observers, that the presence of gall-stones is frequently unaccompanied by any signs or symptoms during the life of the individual, which could give rise to a suspicion of their presence. This fact renders the diagnosis oftentimes exceedingly difficult. Normal bile is generally sterile. This was proven in 1884 by

[1] Maladies du foie.

Netter,[1] experimentally on dogs, and later observers have confirmed his results. Gilbert and Girode[2] found it sterile within twenty-four hours after death in six out of eight cases. Naunyn[3] found it sterile in two cases one and five hours after death, and also in two punctures during life in cases of simple ectasia of the gall-bladder.

When the flow of bile from the cystic duct is completely obstructed, micro-organisms often enter the gall-bladder.

This, according to Naunyn, was first definitely shown by Charcot[4] and Gombault in 1876. They demonstrated the presence of micro-organisms in the bile after ligating the common duct in dogs.

In 1886 Netter[5] found that regularly in dogs, twenty-four hours after aseptic ligation of the common duct close to the duodenum, bacteria could be cultivated from the bile. He cultivated the staphylococcus, and also a short, straight bacillus, which was the bacillus coli communis. The bacillus coli communis, first described by Escherich[6] in 1885, is found normally in the intestinal canal, generally in connection with numerous other germs, and under certain conditions in other parts of the body.

Under ordinary circumstances it is not generally virulent, but given the proper soil and conditions it may rapidly change to an exceedingly virulent germ. So that at one time, as shown by Escherich, it may act as an ordinary pyogenic organism producing local abscesses; at another, as an active pathogenic germ producing fatal septic infection.

Acute cholecystitis, which is generally caused by infection through the bacillus coli communis under the favoring conditions provided by an obstruction of the cystic duct, generally leads to an empyema of the gall-bladder. In this condition we find changes in the walls of the bladder and changes in its fluid

[1] Progrès Médical, 1886.
[2] Comptes-rendus Soc. biol., 1890, No. 39.
[3] Klinik der Cholelithiasis, 1892.
[4] Archiv. de Phys. et Path., 1876, p. 453.
[5] Progrès Médical, 1886, p. 992.
[6] Fortschritte der Medicin, 1885.

contents. The walls may be swollen, œdematous or even infiltrated with pus. The contents, instead of being normal bile, are a mixture of serum, pus and mucus, frequently without any appearance of bile coloring.

Naunyn[1] made exploratory punctures in five cases of gall-stone colic in which the symptoms pointed to an acute cholecystitis, with the view of determining the character of the contents of the gall-bladder under these conditions. In no case did aspiration yield normal bile, and in only one was the fluid distinctly bile-colored, and in this case there was already a large proportion of albumen. The fluid from the other punctures was but lightly colored, contained some mucus, clear albumen and a few red and white blood cells.

In three cases out of five the fluid withdrawn showed the bacterium coli commune in great numbers. In one case it was sterile, in another no cultures were made. In all these cases, with one exception, the symptoms were generally mild, the fever absent or slight, chills single and not severe, or absent. The swelling of the gall-bladder, however, was considerable in each instance, and frequently, at the height of the attack, it could be felt as low as the umbilicus, and was at first very tender on pressure.

In one case the tenderness spread so rapidly over the whole right side of the abdomen, the muscles were so rigid, the respiratory movements of that side so restricted, and the collapse so pronounced, that on the first day after a careful examination a diagnosis of perityphlitis was made.

Courvoisier[2] speaks of an acute or peracute progressive empyema of the gall-bladder. The very few available cases, according to him, terminate fatally in a few days, death following from consecutive peritonitis. Potain,[3] in a clinical lecture at the Hospital Necker, reviews the difficulties in diagnosis with which cases of tumor in the region of gall-bladder are often surrounded, and mentions, in addition to the ordinary variety of empyema, a

[1] Op. citatim.

[2] Casuistisch-statistische Beiträge zur Path. und Chirurg. der Gallenwege, 1890.

[3] Jour. de Méd. et de Chirurg. Prat., November, 1882, p. 488..

very grave condition, which is followed by rapid peritonitis. He alludes to a case which he saw in which death occurred on the second day after the onset of the attack of cholecystitis from a progressive peritonitis, and mentions, also, that in this case the walls of the gall-bladder were not perforated, but that infection had evidently spread from its cavity through the intact serosa, covering it to the general peritoneal cavity.

Roswell Park, of Buffalo,[1] reports a case of suppurative cholecystitis in which the early symptoms, both local and general, pointed to an appendicitis, yet in which an operation showed an empyema of the gall-bladder.

The recent experiments by Barbacci,[2] of Florence, show pretty clearly the rôle played by the bacterium coli commune in peritonitis, due to perforation. It has also been shown that peritonitis, or at least peritoneal sepsis, may, and does, occur in cases of strangulated hernia from an infection by the same bacteria, and without perforation of the gut.

Bönnecken,[3] of Rostock, in 1890, demonstrated clearly the presence of these organisms in the fluid contents of the sac of a strangulated hernia. He experimented on dogs, producing artificial strangulation, and found in the collected fluid the bacterium coli commune in every case. This demonstrates clearly that these organisms, under certain conditions, can pass through the unbroken walls of an intestine and cause either general septic infection or occasionally a suppurative peritonitis.

The spread of infection through the unbroken walls of the gall-bladder can be readily explained in the light of these experiments.

I can find no description of gangrenous cholecystitis as a separate entity, and attribute the occurrence of gangrene in this case to the pressure of the enormous exudate within the walls of the gall-bladder and to a consequent stasis in the vessels. The very sudden onset may easily be explained by the lodgement

[1] ANNALS OF SURGERY, September, 1893.

[2] Centralblatt für Allgemeiner Phy. u. Path., October 12, 1892.

[3] Über Bakterien des Bruchsacwasser eingeklemmten Hernien und deren Beziehung zur peritoneal Sepsis, Virch. Archiv, Bd. CXX, 1890.

of the large stone in the mouth of the cystic duct, and the subsequent intense inflammation probably by the rapid invasion of the cavity of the gall-bladder by micro-organisms from the adjoining gut.

My chief regret is that no facilities were at hand at the time of operation for making cultures of the fluid in the gall-bladder and the pus in the peritoneal sac, and that the conclusions reached must be based on theory rather than on facts derived from a careful bacteriological examination.

HYPERTROPHY OF THE OMENTUM IN HERNIA.[1]

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THE omentum, as one of the contents of hernial tumors, is subject to some of the same changes as the gut, but its structure and uses make also radical differences which should be noted.

The bowel, on account of its changing condition as to emptiness or fullness, its movements and its use as a passage way for descending excreta, has a natural disposition to return spontaneously to the abdominal cavity, and is much less liable to form attachments within the hernial sac than the omentum, which, when extended through the rings, has none of these causes leading to spontaneous reduction, and hence is much more of a fixed quantity.

The bowel, subject as it is to changes in size, is much more liable to distend or stretch the rings, and as subsequent loops are thrust through, with their varying quantity of gas and solid contents, to permanently enlarge the openings through which it was extruded. The omentum, composed of fat chiefly, enclosed in a fibrous mesh-work, is elastic and compressible, and consequently not liable by distention to enlarge the openings through which it passes. Hence we find that the openings through which omental hernia occur, when unaccompanied by other contents, are small and the changes which occur are in the omentum rather than in the surrounding tissues. The protruded portion being folded upon itself, at this point, into longitudinal folds frequently adherent to each other, and the fatty globules elongated from

[1] Read before the Southern Surgical and Gynæcological Society, November, 1893.

pressure, according to the size of the rings, this condition adds very materially to the persistence of the omentum in its extruded position.

The amount of bowel contained within hernial tumors will vary greatly at different times, according to the position of the patient and with the movement of the bowel in the discharge of its natural function, but in omental hernia *purely*, the amount contained within the sac is a fixed quantity (once extruded, always extruded), as the elongated cells at the constricting rings render the mass at these points smaller than that which is further extruded, hence more difficult of reduction, if not actually irreducible in character.

Without strangulation, the extruded bowel seems to perform ordinarily well its functions even when attachments have formed, but the reduplication of the omentum over the lower border of the stomach and over the transverse colon, when inflammatory changes in the sac occur producing adhesions, may, by pulling upon or binding down these parts, produce pain, derangements of digestion, interference with peristaltic action, and hinder or retard the passage of fecal matter.

The bowel will suffer but slight constriction without gross injury; the omentum being elastic will suffer very great constriction without destruction, and may, even at times when both bowel and omentum are contents of the same tumor, protect the bowel by its elasticity from destruction.

The bowel must be protected from injury, and nearly the whole mass may be included in the hernial sac. Injury to the omentum is of little moment, and only the lower border, so to speak, can possibly be extruded on account of its attachments to the stomach and colon.

On account of these very differences the omentum is subject to different handling, which will be hereafter mentioned, but in addition thereto to changes in the extruded portion which more particularly concerns us now. The small size of the opening through which it has passed interferes sometimes with its venous reflux, by constriction; at times sufficient to cause an hypertrophy or hypertrophic increase of tissue, and both the fat cells

and fibrous tissue may partake of this growth. Usually it is the fat growth which predominates, in which case the spider-like meshwork in which these cells have been enclosed is partially lost and the fat cells aggregate together forming masses which vary in size from a pin-head to that of the end of the finger, and are matted together like a bunch of grapes, giving a soft doughy feel; in other words, a lipomatous growth. Again, the distinct spider-like meshwork is lost and there is a true growth of both fibrous and fatty tissue presenting a hard feel, as hard as a fibrous tumor—a fibro-lipomatous growth. In these latter cases the fibrous and fatty tissues are more or less blended together. These new growths may appear upon any portion of the extruded omentum, usually, however, at its lower border and may be of any size imaginable, the whole mass being so thick as to render a previous diagnosis of concurrent extruded bowel an impossibility. On opening the sac the mass will be found fold on fold, packed closely, and frequently matted together by inflammatory adhesions. On a separation of these, which, with care, can generally be done, there may be, and usually is, found only a small portion of the omentum proper, the balance being these new lipomatous growths as described, the line of distinction between the new growths and the omentum proper being well marked. The omentum proper is gathered into longitudinal folds and rounded where it passes through the rings, but these can generally be spread out into its distinctive folds up to the point where it passes through the internal ring. The whole mass then presents an apron-like appearance with a heavy irregular fringe hanging from its lower border. The mass not unfrequently has attachments within the hernial wall to the sac, to a portion of the bowel if such be extruded along with it, or to the testis, and the vessels in the omental portion proper are all very much enlarged. Such a tumor is, of course, irreducible and subject to indefinite growth. It is subject to complete strangulation, to abscess and to cysts, the latter simulating hydrocele, and have been tapped and injected with iodine, producing inflammatory conditions and adhesions in consequence.

What are the indications for treatment? Left to itself we

have a constantly increasing and indefinite growth, a dragging weight upon the stomach and transverse colon, pain, inconvenience, etc. Reduction can only be made by the exercise of undue force or by sacrificing the integrity of the rings and abdominal wall, and with the possibility of constantly increasing growth after reduction, with no lessening of the dragging weight upon the stomach and colon or the symptoms produced by it.

With excision the possibility of attachments within to the abdominal wall or to the bowels through its broad base, the danger of sloughing below the ligatures and the danger of hæmorrhage from one or more of its many supplying arteries, these latter dangers reduced to a minimum since the advent of aseptic surgery.

Practically, there is little danger from either of these causes under proper management. To obviate the discomfort, to overcome the dragging weight and pain, to prevent the pulling upon the stomach and colon, to prevent interference with the passage of fæces, is sufficient warrant for excision in these cases, and the rule should be *complete excision with reduction of the stump* and closure of the rings. *If reduction cannot be made, excision at any rate.*

In the accomplishment of this procedure there are important points to be remembered.

The possibility of a loop of intestine being enclosed within the matted folds of the omentum and completely hid from casual inspection. These folds are sometimes so thick as frequently to render a previous accurate diagnosis of the contents of a hernial tumor of this character a matter of impossibility, and even on inspection the folds may so surround the loop of intestine as to completely hide it from view; hence the necessity for a complete withdrawal from the sac and a complete unfolding of the layers as they lie closely packed together so as, by ocular inspection, to satisfy ourselves as to the non-existence of such a complication.

Not infrequently there are extensive attachments between the folds and the intestine. In such cases careful separation should be made, tying off the omentum rather than exerting any

degree of forced traction on the gut. The same may be done with attachments to the sac and to the testis when such exists. It is well to remember, also, in large tumors of this kind, being irreducible, that a previous diagnosis of attachments to the sac, testis or gut cannot be made. In attachments, tying off is better than tearing, as the smallest bleeding may be the source of much annoyance after reduction of the stump. In tying off the tumor, it should be done as near as possible to the ring, at least, inside the longitudinal constriction spoken of, so that the final reduction of the stump can be more easily accomplished. The old method of tying off the stump with a single ligature, or even a double ligature, it is to be hoped, has passed completely into disuse. The mass as it projects through the rings, in these cases, is too large and too elastic for one ligature to safely constrict the numerous small vessels which pass through it, and in addition thereto, the tying in mass of such a stump is likely to produce traction on the stomach and colon, or by its attachment to the abdominal wall to form a bridge behind which strangulation of gut could take place. Hence, it is desirable to ligate with some absorbent material in small masses, each mass containing not more than one or two vessels until the whole breadth of the unfolded base is traversed in this way. Properly prepared catgut is suitable material, but better still, in my opinion, is the small-sized kangaroo tendon, as recommended by Dr. H. O. Marcy, used with the cobbler's stitch, but with constriction not too closely made that sloughing may not occur below. This will control all bleeding of the mass when excised, but should there be a bleeding point left it can be controlled with the forceps and ligature, or with a curved needle and ligature above the line of stitching already made. All ligatures should be cut short. If the omentum has been excised sufficiently high to come within the line of longitudinal constriction, the stump will now be reducible generally without difficulty or with very gentle pressure, and the rings, canal and sac are left to be handled in the usual ways, according to the special preference of the operator or special indications in each case.

If strangulation exists in the omentum alone or omentum in

connection with the extended gut, we have not the same question at issue as we have in the gut, the rule of excision holding good with the omentum without reference to vitality. It is well to say that the extension of severe inflammation by means of the omentum through the rings, producing general inflammatory conditions in the abdomen, is a rare occurrence, and not greatly to be feared.

The specimen presented herewith is not given as a rarity, since I believe that the condition of hypertrophy presented is not an infrequent one, especially where such tumors are of long standing and composed of omentum alone, but as a typical one of its class. It is from a negro, thirty-four years old, was congenital, and existed until early manhood, about the size of a goose-egg; was increased somewhat about thirteen years since by hard work in a rolling-mill, and since that time has had a constantly increasing growth until it reached more than half way to his knees. Its length was eleven inches, its greatest thickness four and a half inches after being unfolded, and its weight slightly above five pounds. It was an unendurable nuisance. For this purpose it was removed, closure being made at the same time with perfect result.

AN IMPROVED METHOD OF BRAIN LOCALIZATION IN EPILEPSY.[1]

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IT seems to be nothing but germain to our pathological views that a disease which is so well characterized by its specific symptoms as the so-called idiopathic or genuine epilepsy should have its detectable morbid substratum. Still, only recently have investigations, and prominently those of Van Gieson, thrown some light on such cases, that heretofore have been wrapped up in the mysterious cloak of purely functional morbidity. The difficulty is that it takes an expert microscopist to detect the tissue changes, and that the examination has to be made during the operation unless it should be preferred to operate in two stages. But aside from the idiopathic form of epilepsy, and even then when gross changes are present, the correct determination of their seat and extent is not always easy. For I think there is no doubt that while epilepsy is only a symptom of very different diseases of the brain, and perhaps the spinal marrow, it will in most cases be only a certain circumscribed portion of those central organs where the morbid changes have taken place. It is consequently of the highest importance to the surgeon to get an indisputable method of mapping out the diseased area, because only then will he be able to decide whether a radical operative undertaking is feasible and justifiable or not. The brilliant discoveries of the physiologist and neurologist have presented the surgeon with a firm base for his action, and the wonderful ease with which we now localize, in a great many cases, the field where the morbid changes have

[1] Being a part of a paper read before the meeting of the Southern Surgical and Gynæcological Association at New Orleans, November 15, 1893.

to be looked for, makes it an easy task to find the pathological evil-doer. A large bone flap is raised, sight, touch, puncture and other known means are used, and in many instances even the tyro will find his way.

Still, no experienced surgeon will be satisfied with the present diagnostic methods. There are too many cases where all those means fail to disclose the real trouble, and still more, perhaps, when not enough of the cortex is removed from not knowing the real extent of the morbid tissue. The great number of failures to effect a permanent cure are only partially due to consequent cicatrization or to adhesions; the greater number are to be ascribed to our inability to find and correctly estimate the diseased part. Because even the seemingly unfailing topographical, as well as the electrical, methods of localization, do not protect against mistakes. They may even lead astray. It is the object of my paper to prove the correctness of such a view, and to propose a method for consideration which promises to make localization of the diseased brain focus safe and extremely simple. In pointing out some of the sources of the difficulties, mistakes and errors in the present methods, I first would mention untoward outside circumstances. For instance, wanting opportunity to witness the initial signal, erroneous statements of the patients or of their relatives, etc. In the "Reference Handbook of the Medical Sciences," there may be found so excellent a survey of these things, given by Professor Keen, that I may abstain from further discussion.

Secondly: A great number of brain foci are not yet discovered, and as presumably all peripheric muscles and all extracerebral ganglia are in some way connected with brain centres, all the former can be set into epileptic action by disorders of the latter. But not knowing these connections, and not having paid sufficient attention to the more hidden signals—for instance, such as in the generative or alimentary or uro-poietic organs—the commencement of the convulsion will easily be ascribed to a better known and more exposed group of muscles in the face or extremities, which may have become excited only secondarily by the dissemination of the epileptic wave started somewhere else, and

consequently a wrong brain focus will be singled out and perhaps operated on. It will have struck everybody, for instance, how often abnormal sensation or motion occurs in the stomach or in the intestines as the first sign of an attack; there may be nausea or vomiting or only a strange feeling. Still, we are in the habit of watching for a twitching or a contraction of some muscle in the face or hand or arm, and may fail to recognize the real initial signal altogether. Of course the removal of a thus falsely located focus will do no good.

Thirdly: The brain foci are, as we know, not strictly defined localities; they are interlocking and overlapping each other. Thus the same diseased point may stand in close relation to the functions of two or more groups of muscles, and therefore cause very mixed convulsions. The same condition may be caused by the extension of the same pathological process over or into various adjoining foci, as evidently the area of pathological changes is not defined by its physiological character. Under such circumstances the initial signal may be given by different sets of muscles simultaneously, or the same muscles may act promiscuously, once sooner, the other time later, than the others.

Fourthly: The topographical as well as the electrical localization does not locate the seat of the morbid process. They both only map out the physiological focus belonging to a certain group of muscles. If this focus be removed, the circuit will, no doubt, be broken; and even if it was not, the diseased portion of the brain, the epilepsy, as far as these muscles go, will cease, and perhaps even entirely, at least for some time. Because it is a known fact that almost any surgical interference will exert a temporary beneficial influence upon the disease. But it will return sooner or later, for the real evil-doer will persist to exert its vicious influence and will most likely find another victim to prey on. The question whether the focus belonging to a certain epileptic process is always diseased itself, or whether it is not frequently only secondarily irritated by another diseased portion of the brain that stands in a topical, anatomical or physiological relation to the former, looks at the first glance almost foolish. Still, if we consider that the removal of a chip of bone or of a

depressed piece of the skull, or of a cyst or an abscess, will at once stop the abnormal action of an underlying or adjoining focus, then it appears to be evident that this latter was not the seat of the trouble, but that it only was induced to act perversely by the irritation of a foreign substance. Of course, it is possible that the focus acted upon had been naturally excessively irritable, though within physiological limits; or that it, by the long-continued vicious influence it had to endure, became unduly irritable; still, even then it would not act epileptically without the particular provocation of the existing foreign body. Now, there is no reason why a densely cicatrized, or a gliomatous or a sclerotic plug should not act exactly like a foreign body. Seen in this light, there are then two possibilities before us; either a focus is so diseased that it will functionate viciously on certain biological provocations, or a healthy focus becomes so irritated by a diseased neighbor as to act epileptically on certain unknown occasions. The first modus can be surmised either when the pathological changes are confined only to one part of the focus, the balance remaining healthy, so that the diseased part will act as the foreign body on the balance; or when the morbid alterations are not sufficient to interfere with the specific compound work of the cell cluster, perhaps only a small number of the cells or only one of the layers of the cortex being out of order; because, if the whole focus were totally degenerated, then, from all analogy with other pathological experiences, there would be no functionating at all, either normal or abnormal. We are as little entitled to expect a specific energy from a disorganized piece of gray matter as to expect a specific energy from a degenerated gland. As to the second condition, namely, that a physiological centre is so irritated by a diseased neighbor as to act epileptically, it is too obvious that little good can come from the removal of the former.

From all such considerations, we must confess that the present methods of detecting the real seat of the disease are not sufficient unless the pathological changes are plainly seen or felt. As soon as the surgeon has to depend upon topographical or electrical localization alone he may be misled, because he is only

striving at the mapping out of the physiological focus of the muscles that have given the initial signal. But there is, as can be concluded from the explanation given, no proof that this focus really is the diseased portion of the cortex. Besides, such methods are no guides as to the extent of the disease; it is left to chance whether enough or too much be removed. If, though, my proposition, which has given full satisfaction in two cases, should turn out to be what it has promised, then all difficulties would be removed at once. *My advice is to use the induced current not solely to find the physiological focus belonging to the muscles giving the initial signal, but to find the spot from where an epileptic attack of the same nature the patient is accustomed to suffer from can be started, independently of the fact whether those two points coincide or not.* Under this rule it is not necessary at all to be so very scrupulous in localizing the part to be attacked before the operation, although there is no objection to it. It will be desirable to lift up a large bone flap over the presumable field so as to get a wide area accessible to examination. If no definite recognizable changes sufficient to explain the trouble are found, the electrodes, as devised by Keen (two wire points about ¼ to ½ inch apart), should be extensively applied over the whole area. When the place from which epileptic convulsions can be elicited is hit, the experiment should be repeated so as to leave no doubt about it. If exsection should have been decided upon, the current has to be applied to the borders of the brain wound again and again until epileptic symptoms can no longer be produced, in order to rest assured that every particle of diseased tissue has been removed. It is possible that more than one epileptic centre or focus exists; of course in that case all of them ought to go if the patient is to be relieved of his epilepsy.

Now, the objection may be raised that a strong current may irritate healthy cortex so much as to throw the patient into an epileptic fit. Then the proposed test would obviously lose all its value. But according to Ferrier's experience it takes a prolonged, often repeated electrical abuse of a monkey's brain, at least, to render him epileptic. Healthy cortex does not respond to electrical irritation by epileptic convulsions. It must

not be forgotten that electricity is by no means the natural physiological force in nerve action. It is nothing but a very energetic stimulus, but perhaps not even as powerful as heat, cold, chemical influence, and so on. It seems but natural, then, that it should stimulate a certain cell to its specific energy and to nothing else. If, therefore, this specific energy of a brain focus is to cause contraction of a certain set of muscles, then upon electrization, such and no epileptic fit will follow, which is certainly an entirely different thing. On the other hand, if diseased tissue has acquired the morbid force necessary for the production of epilepsy, it will exert this, its vicious influence, as soon as it is stimulated, either by electricity or any other irritating force. It is certainly not plausible that the nerve-cells should have to produce as much of an electrical force as our powerful machines in order to affect each other or to set the depending musculature in action. It is astonishing what an immense strength of current is sometimes needed to produce even the slightest physiological peripheral effect from cortical electrization, while the slightest touch of the electrodes will at once produce a regular fit when applied to the right spot.

Another objection, that the proposed use of the current may afterwards turn out to be injurious to the brain, can be dismissed, too. All experience speaks against it. I, for myself, can state that even prolonged use of the galvanic current, even of a strength of 20 to 30 milliampères, and repeated daily for many months, had not only no unwholesome, but, on the contrary, a very beneficial effect upon the functions of the brain.

There is, then, no excuse for not trying to arrive at a reliable information about the real location of the morbid tissue in epilepsy by the use of extensive and, if necessary, repeated application of the induced current. We need not be afraid to throw the patient into two or more attacks while he is on the table.

In support of my views, I present the histories of three cases. It is not much I have to offer. The operations, though, have been witnessed by several medical men and closely and critically observed.

The first history proves, in my opinion, that a perfectly degenerated piece of cortex, not exerting any function itself, may cause a neighboring piece to act epileptically. The second case shows that a diseased focus may render a sound neighbor epileptic without causing its own depending musculature to give the initial signal.

The second operation on the first-mentioned patient confirms this supposition. The two last operations show, besides, beautifully the value of the proposed method in the detection of the diseased brain tissue. There was no doubt left in the minds of the witnesses regarding the correctness of the discussed test, at least in these two cases.

CASE I.—H., a stout German laborer, thirty years old, was taken with his first fit when sixteen years old. He attributes it to a sudden scare; did not receive any injury. The signal is given by the muscles of the neck, which get drawn to the right, after which general convulsions of extreme severity spread over the right, and from there to the left side. He has taken medicines for many years, was trephined a year ago and had submitted to direct cerebral galvanization. Got relief from the latter for some months, after which time the old condition set in anew. He was then operated on in St. Mary's Infirmary, with the kind assistance of the surgical staff. In about the posterior and inferior corner of the corresponding focus a yellow spot of the size of a nickel was easily made out. It was removed and the wound treated by iodoform gauze, etc. *There was not the least amount of paralysis of any muscle to be detected, while the epileptic attacks stopped at once.* After several months of perfect relief a somewhat different form of epileptic spells developed gradually. They were attributed to adhesions and perhaps to too large an opening in the skull, which annoyed him greatly. The spells were more of a general disseminated character; according to his statement there was a good deal of permanent dulness and aching of the brain. Unfortunately, no spell was seen by an intelligent observer, so that I had to depend a good deal upon the patient's own description and that of his companions.

CASE II.—B., a boy of about eighteen years, had a fall and brain fever (?) when six years old. Signal is given by twitching in the left wrist, which also, in the intervals between his attacks, feels

dull and deadened. Retina blurred, but no choked disks. Diagnosis: Most probably a cyst.

H. was trephined a year ago without any benefit to him. The second operation (June, 1893) consisted in a free enlargement of the trephine hole and incision of the dura. The cortex looked engorged, the veins much distended over a large area. A spot behind and on a level with the middle of Roland's fissure was of almost a black color. Right under this spot palpation detects a kind of a yielding hollow place. An incision reveals a narrow, deep cavity. The circumference of this incision, representing the mentioned dark spot, is excised. Now, what was of the utmost interest was the response of the different portions of the cortex to the induced current. They mostly reacted slightly physiologically, causing the depending muscles to twitch and contract, or not at all; but the black spot responded promptly by a regular epileptic fit, whose initial signal, though, could only generally be located in the left hand and wrist, the observer having been overcome with surprise.

When the patient came out from the chloroform, the wrist was found free from the previous sensations, had perfectly normal mobility and sensation, but the thumb was absolutely paralyzed. The patient had a rapid and perfectly satisfactory recovery until, in the fifth week after the operation, he received a terrible blow against his head. He died from general encephalitis without having had another epileptic attack. Here the centre of the thumb was evidently the principally diseased piece of cortex, but the intermixed and adjoining centre for the muscles of the wrist was the one that had always given the signal.

CASE III.—The patient whose history was first given was resubmitted to operation only four days ago, as his fits gradually became severer. The object of this last operation was mainly to break up supposed adhesions and to close the large cranial opening. There was found a thickened dura, and between it and the cortex dense adhesions over an area of about three inches in diameter. There was a well-marked depression in the cortex, corresponding to the exsection done in the first operation. The induced current now applied, even with such strength as not to be endured by my fingers, produced no contraction in any peripheric muscles, but as soon as the electrodes were applied to a spot corresponding to a portion of the focus for the hand and forearm, a regular epileptic spell, starting in the hand and extending in Jacksonian manner over the whole side, was easily elicited as often as the experiment was repeated.

UofM

This point was the direct continuation of the area which was excised at the first operation, recognizable by the mentioned depression. There was nothing further done, as I did not feel justified in paralyzing the man's arm and hand without his consent.

In this case evidently not enough was removed in the first operation, in which no current had been used for localizing purposes. Abstaining from all speculations on mistakes that may have been made in localization, diagnosis and surgical procedures, and how much adhesions could have had to do with the recurrence of the epileptic convulsions, I claim that the case is a strong proof of the great and almost absolute value of the proposed test in mapping out the location of the diseased cortex.

Additional Note.

After having read my paper before the Southern Surgical and Gynæcological Association, November 15, my attention was called to an article in the *British Medical Journal* of the fourth of the same month, wherein Professor Sherrington, of London, gives the history of a most interesting case, which is so similar to one of mine, and where some points made are so much in conformity with the views I had expressed, that I take the liberty to append a short abstract of it: A boy of fifteen years has four to fifteen attacks daily. They start with a tickling sensation in the sole of the right foot, followed by contraction of the great toe, extension of the ankle and flexion of the knee; occasionally slight flexion of the fingers. Trephining just behind Rolando's fissure. The cerebral substance at the lower part of the exposed area looked discolored and was freely excised. No improvement followed. Second operation: The former opening was enlarged and the electrodes applied to the cortex. No response was produced on stimulating the lateral and posterior part of the exposed surface, but on applying a strong current just above the part previously removed, movements of the foot and knee similar to the epileptic spasms were produced. After one or two stimulations a typical clonic spasm was produced, which lasted after the withdrawal of the electrodes. The area by stimulation of which these movements were produced was about the size of a sixpence and was situated just above the discolored area previously removed. It was freely excised to the depth of three-fourths of an inch. There was

no loss of power in the right leg or foot, and no impairment of any movement, etc., but there were some slight attacks of clonic spasm of the arm, chin, shoulder, etc., without any participation of foot or leg. He steadily improved, and for the last two months (about eighteen months after the second operation) he has, during the early hours of the evening, one or two slight attacks of contractions of the muscles of the right thigh and hip-joint, which often do not awaken him. He does not lose consciousness. The statement is made that in the portion of the cerebrum excised at the first operation, which was examined microscopically, the discoloration was found to be due to "altered blood," but that nothing abnormal was detected in the part removed in the second operation. I do not know whether the examiner was familiar with Dr. Van Gieson's microscopical methods and discoveries. But conceded even that nothing pathological could be found, the salient point that not even gross changes, and so much the less topographical and electrical localization, will serve as reliable guides in the discovery of the real source of the trouble, while the excitation of a veritable epileptic fit will do so is clearly shown. The perfect failure to produce muscular action by even the relatively strongest currents applied upon the cortex, surrounding the epileptic zone, is explained, in part at least, by having struck one of the inexcitable blanks first observed to exist in the motor area of man by Lloyd and Deaver, and in the ourang by Beevor and Horsley. In my opinion, though, this explanation can hardly be accepted; because the extent of inexcitable cortex, from my own experience and that of others, would be much too large; in fact, it would sometimes comprise the whole exposed surface with the exception of a very limited epileptic spot. I think that in Professor Sherrington's case the morbid changes extended over the portions removed in the first and in the second operations; and that if the current had been used in the first one epileptic response would have been elicited from the first excised portion as well as from the one removed in the second operation. The persistence of slight epileptic symptoms may be due to a diseased portion left behind, which would have been detected by applying the current again after the excision.

In Professor Sherrington's article reference is made to a history of another case, reported by Professors R. Parker and F. Gotch, of Liverpool, in the same journal, of May 27. Here the initial signals could not be made out in a definite way, but the foci of the thumb and wrist were finally settled on as the ones most likely at fault.

They were mapped out by topographical, and in the operation by electrical, localization. (Again the enormous strength necessary to produce muscular contractions startled the operator.) Patient kept on having from six to forty spells a day, though he improved somewhat further on. Now, the electrodes were applied on four places, all of them, though, in front of the fissure of Rolando. The two uppermost points were found to be the foci wanted, and were excised. The failure of the operation seems to me easily explained by the failure in the detection of the real seat of the disease. Had the electrodes been applied to a larger area, and, before all, to the cortex behind the fissure, the spot from which a *real epileptic fit* could have been started, would likely have been found, and upon its removal a better condition would have been obtained.

I concede that my idea is not yet sufficiently verified by experience, but I think it is worthy of consideration and of an unbiased trial.

AN EXAMINATION OF THE INFLUENCE OF THE ILIO-PSOAS MUSCLE UPON THE ROTATION OF THE THIGH.

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OF BROOKLYN,

DEMONSTRATOR OF AND LECTURER UPON ANATOMY, LONG ISLAND COLLEGE HOSPITAL.

THE ilio-psoas muscle flexes the thigh upon the pelvis or the pelvis upon the thigh; it approximates the bone to the median line of the body or adducts the thigh; it rotates the femur about a vertical axis. Thus far are anatomists agreed. Until recently the statement of the standard text-books that the muscle in question rotated the thigh-bone outward has stood unchallenged, and at the present time is supported by such authority as Gray, Holden, Macalister, Owen, McClelland and Ranney, as well as many others. The last edition of Quain seems to be silent upon this particular phase of its action. J. H. Davies-Colley, however, writing in the recent text-book known as Morris' Anatomy, throws down the gauntlet to the generally accepted theory in the following words (p. 366): "It has been sometimes described as an external rotator of the hip; and its insertion into the lesser trochanter at the inner side of the femur would appear to favor this view; but a little consideration will show that, although it is attached on the inner side of the femur, yet, on account of the angle which the neck of the femur forms with its shaft, this point of attachment is really external to the axis about which the rotation of the femur takes place. It will follow, therefore, that any power of rotation exercised by this muscle will be rather internal than external."

The editor, Dr. Morris, discussing the anatomy of the joints in the same work, apparently disagrees with his collaborator, for,

by way of indirect contradiction, at least, he says (page 270; italics supplied): "Adduction and inward rotation are very limited in the extended thigh; adduction on account of the contact with the opposite limb; the inward rotation, because *all the muscles of internal rotation* (*save the tensor vaginæ femoris*) *are also extensors*, whereas most of the other extensors are also outward rotators, so that each set requires to be relaxed by flexion before inward rotation can be perfected."

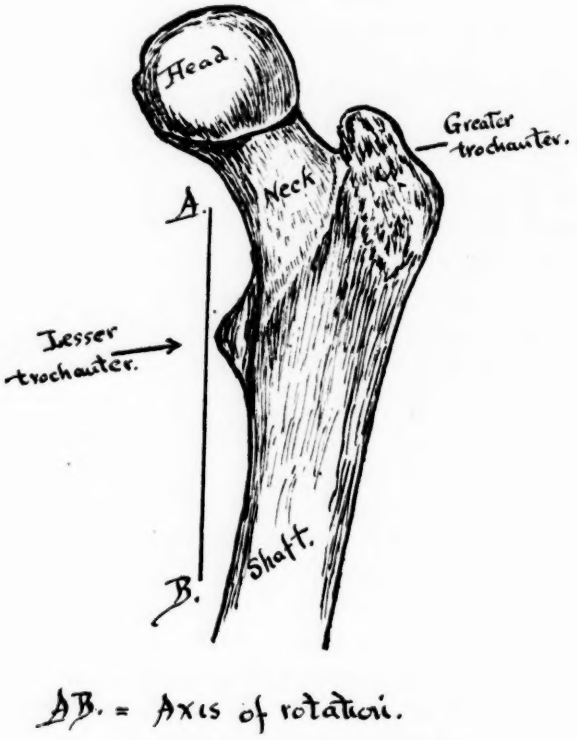

FIG. 1.—Showing axis of rotation of femur.

In order that the subject may be more fully understood, it may not be improper to call attention to a few points connected with the anatomy of the hip joint and of the ilio-psoas muscle. The head of the femur forms about three-fifths of a sphere, and is embraced by the cavity of the acetabulum and its fibro-carti-

laginous rim, the so-called cotyloid ligament. So far as the principle of mechanics involved is concerned, it may be considered as a complete sphere enclosed in a shell which is exactly applied to its surface, and within which it moves in every direction around a centre, which is the centre of the sphere itself. That only parts of the spherical surface and of its cavity of reception are covered by articular cartilage, as well as of the existence of certain

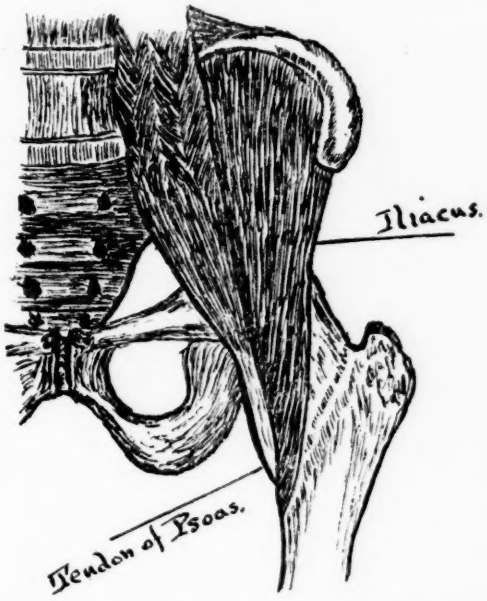

FIG. 2.—Showing relation of ilio-psoas muscle to femur.

inequalities around the dimple, may be explained by the fact that the latitude of the various motions of the joint is limited either by the tension of its ligaments or the approximation of surrounding parts. The spherical head is supported upon a stout pyramidal process called the neck, flattened somewhat in its antero-posterior diameter, having an upper border about an inch in length, looking somewhat forward, and a lower border about an inch and a half in length, looking somewhat backward. It joins the shaft at an angle of about 125°. Inasmuch as the femur is

inclined obliquely inward, the line of gravity falling through the centre of the head and the external condyle, the inclination of the neck to a perpendicular is increased to about 140°. The neck also juts forward at an angle of about 15°, so that the head of the femur is in a plane anterior to that of the shaft.

It will thus be seen that the head of the femur in articulating with the acetabulum, looks upward, inward and forward. The lesser trochanter is developed at the union of the shaft and the lower border of the neck, and, therefore, lies in a plane posterior to the head.

The ilio-psoas is made up of two parts, sometimes described as distinct muscles; the iliacus and psoas magnus. Both arise within the pelvis and their fibres, converging, pass out under Poupart's ligament, across the horizontal ramus of the pubes, just internal to the pectineal eminence. The iliacus, lying to the outer side, is inserted, principally, into the tendon of the psoas, which, in turn, is inserted into the lower and back part of the lesser trochanter. A few fibres of the iliacus pass to an independent insertion into a line or ridge just below and somewhat anterior to the trochanter. After crossing the pelvic brim the ilio-psoas changes its direction, passing downward, backward and outward to its insertion, and, from a mechanical standpoint, this is the only part of the muscle to be taken into account in studying its action upon the movements of the femur. It must also be borne in mind that the line of gravity of the femur coincides with the radius of its motion in flexion and adduction and is the axis about which it rotates.

As the muscle contracts, its origin being its fixed point, the femur is undoubtedly flexed, adducted and rotated at the same time, and, to properly study its influence upon rotation, this complex motion must be analyzed and the factors of flexion and adduction eliminated. The downward inclination of the tendon is prejudicial to every action of the muscle upon the joint, and is one of necessity only, so to speak. Its backward inclination influences flexion, the lesser trochanter describing the arc of a circle forward in an antero-posterior plane. Its outer inclination influences adduction, the trochanter describing the arc of a

circle inward in a transverse plane. Both of these planes are vertical, and the radii of the arcs are equal to the vertical distance between the centre of the head of the femur and the point of attachment of the ilio-psoas tendon.

In the rotation of the femur the lesser trochanter also describes the arc of a circle. The radius of this arc, however, moves in a horizontal plane, passing through the lesser trochanter, and the centre of the circle is the point where this plane is intersected by the axis of the rotation of the femur.

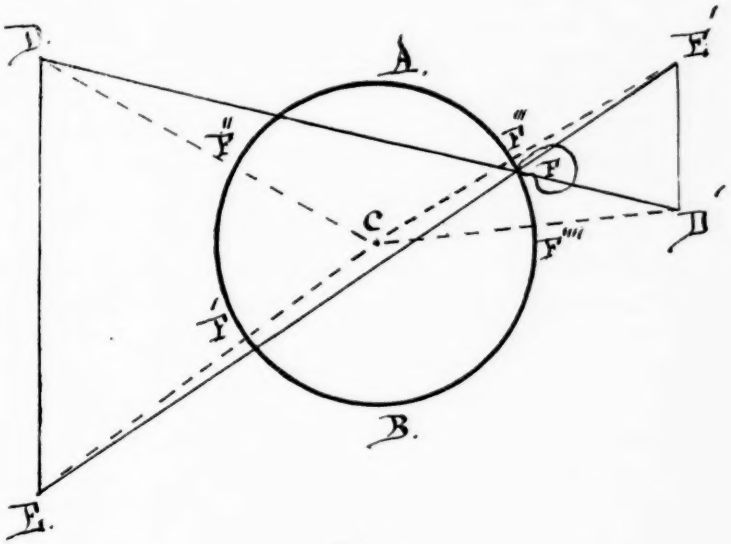

FIG. 3.

Let Fig. 3 be supposed to represent a horizontal plane passing through the body, at the level of the lesser trochanter; F, the femur; D E, a line drawn antero-posteriorly through the median line of the body; C, the point where the plane is intersected by the axis of rotation of the femur. It will appear quite evident that traction upon F in the direction of the line E F would draw it toward the point B, and pass it to the point F′, which is situated in a line between C and E. That is, it would rotate the femur inward. If, however, traction were to be made in the direction of the line D F, the trochanter would move

toward A and pass it to F″. That is, it would rotate the femur outward.

The following rule may, therefore, be formulated, viz.: All muscles attached to the femur, which have their fixed point internal to the axis of rotation, rotate the bone internally, provided the line of traction, or such line extended, passes anterior to such axis. If the line of traction passes posterior to such axis, the rotation will be external.

By reference, again, to the figure, let the line D′ E′ be drawn external to the femur, and it is evident, with respect to muscles arising therefrom, that the rule would be reversed. Whether or not, then, the ilio-psoas is an internal rotator, the reason alleged in support of the proposition in Morris' Anatomy is insufficient.

As an argument in support of the action of this muscle as an internal rotator, Dr. Jarvis S. Wight, of Brooklyn, alleges that in examinations made upon the cadaver, forcible external rotation of the thigh makes tense its tendon, and, conversely, it is relaxed by internal rotation. This would seem to be a most practical demonstration of the truth of his theory, provided he had carefully eliminated the motions of flexion, extension or adduction from the problem.

The writer of this article is inclined to believe that Dr. Wight experimented upon the joint in the extended or over-extended position of the thigh, since, under such conditions, he has obtained similar results, but he is, also, from repeated experiments, as certainly convinced, that in the flexed position the tendon is made tense by internal rotation and relaxed by the opposite motion. Since in extension the head of the femur is firmly held in its socket by the tension of the capsule, and in flexion the ilio-psoas tendon is relaxed, the above demonstrations are somewhat difficult to make, but not sufficiently so but that it is plain that in the extended position what rotation does occur through the influence of the ilio-psoas, is internal, and in the flexion of the thigh, especially if accompanied with adduction, external rotation is marked.

To apply the mechanical principles hereinbefore set forth to the case in question, certain measurements have been made with

the thigh extended, and it is found that a point at the lower part of the lesser trochanter is distant nine-tenths of an inch from the axis of rotation of the femur; that it is six-tenths of an inch external and seven-tenths of an inch posterior thereto. This represents the point of attachment of the ilio-psoas tendon. The fixed

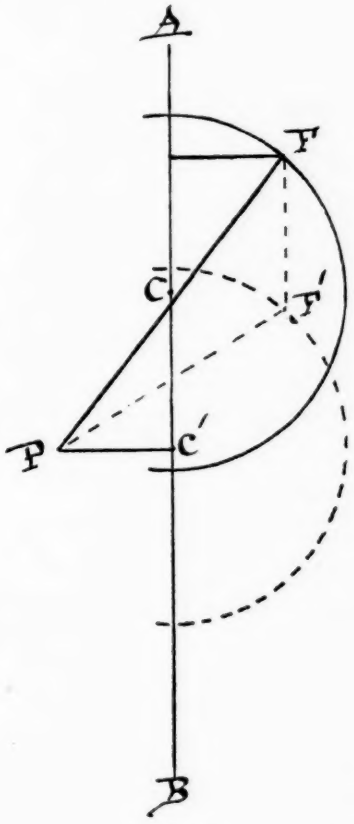

FIG. 4.

point from which traction is made may be taken as situated upon the anterior margin of the horizontal ramus of the pubes, just internal to the pectineal eminence. This point is six-tenths of an inch internal and eight-tenths of an inch anterior to the axis of rotation of the femur.

If, now, these points be projected upon a plain surface, and C be the axis of rotation, F the attachment of the tendon to the femur, and P the fixed point of traction (as in Fig. 4), the line will pass in front of the centre of rotation, and internal rotation be the result.

But in mid-flexion C will be found in a line with P at C′, having swung forward along, A B, an antero-posterior arc. The line of traction, P F′, now passes posterior to the centre of rotation at C′, and the action is that of external rotation.

AN IMPROVED LOCK FOR PAIRED INSTRUMENTS.

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IT has now been more than three years since I devised an improved lock for paired instruments which has proved so satisfactory that I have adopted it for scissors, artery forceps and sponge holders. The chief advantages of the lock are the facility afforded in the rapid adjustment and detachment of the blades of the instrument and the easy access to all of its parts in cleansing.

I first used the lock on the long delicate forceps employed in cleansing the abdominal drainage-tube. The accompanying

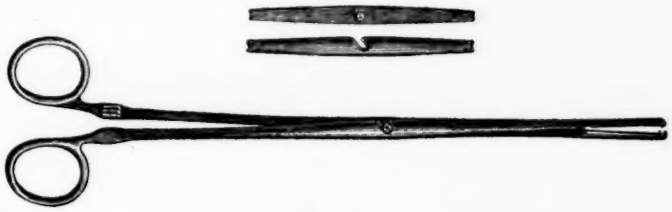

FIG. 1.

cut (Fig. 1) of this instrument is taken from the Johns Hopkins Hospital Reports, Gynæcological Fasciculus, No. 1, page 189.

From this cut it will be seen that the female portion of the lock is a simple slit running in an oblique direction to the long axis of the blade, while the male portion consists of a round, capped pin.

This lock, while satisfactory in the instrument for which it was devised, required some modification for other paired instruments.

As modified, the slit in the female blade is cut at right angles and the socket is rounded and larger.

The cap on the pin of the male blade is flattened on two sides in such a way that it can only be introduced into the

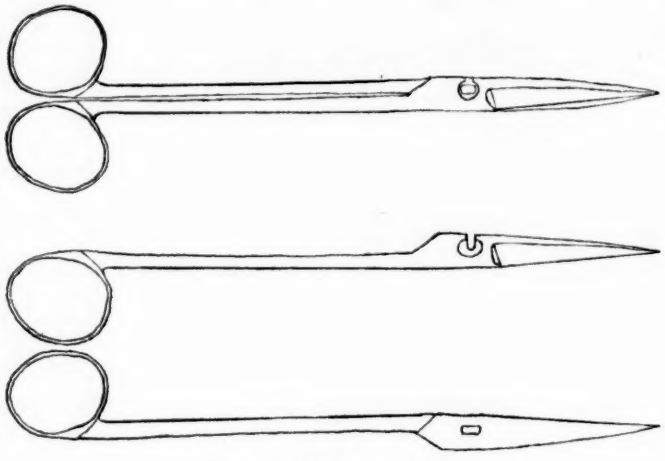

FIG. 2.

female blade by bringing the blades together at right angles. The adjustment of the blades at this angle prevents their detachment while in use.

Fig. 2 shows scissors fitted with the latest improved lock.

A NEW SPIGOT ATTACHMENT TO FACILITATE ASEPSIS.[1]

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WHILE the general principles pertaining to an aseptic technique are everywhere agreed upon, the attention paid to

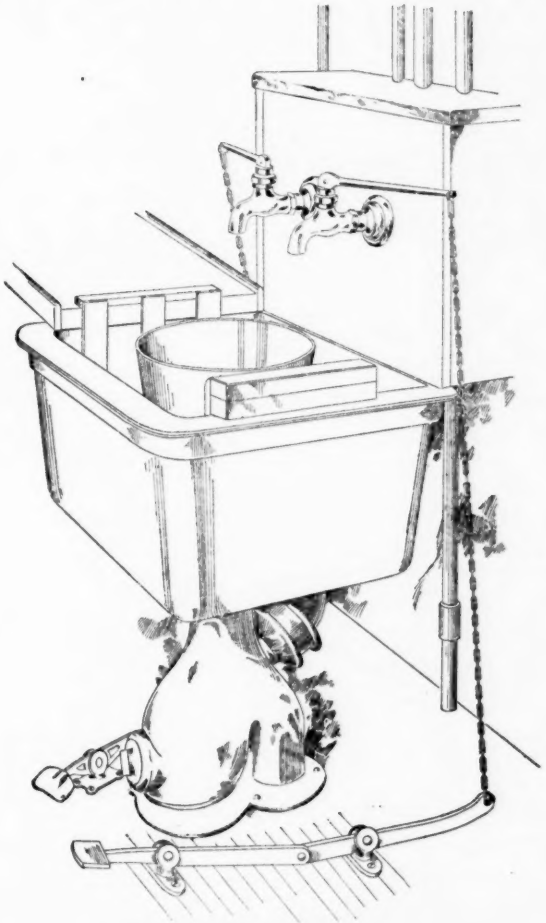

FIG. 1.—The spigot attachment.

[1] Read before the Johns Hopkins Hospital Medical Society, October 23, 1893.

the smaller points is often insufficient. I believe, however, that we should rather run the risk of exaggerating than of underestimating the importance of the minutest details, and that

FIG. 2.—Apparatus in use.

nothing that will tend to diminish the possibilities of contamination should be thought unworthy of our attention. As an outcome of this thought, I present the following:

In cleansing the hands and forearms before an operation, it is necessary to change the water frequently, and to do this the ordinary spigot must be turned on and off with the hands. As it is not possible to be sure that the spigot handle is always sterile, I have devised a contrivance by the employment of which all necessity for touching the spigot with the hands is avoided, and also an appreciable amount of time is saved as well. Instead of the regular short handle to the spigot, a horizontal bar is provided long enough to project well beyond the basin or the washstand. To the end of the rod a chain is attached, which reaches down near the floor, where it is connected with a long lever worked as a pedal. The chain is provided with an endless screw, by means of which its length can be so regulated that the surgeon standing in front of the basin can control the water supply with his feet. I have had one of these arrangements made, and it is now in use in the operatign room at No. 1418 Eutaw Place. The floor under it is protected by a rubber pad attached to the under surface of the pedal, and the length of the chain is so adjusted that the proper flow of water is insured.

I feel sure that by this device one possible source of contamination of the hands is easily and certainly eliminated.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 22, 1893.

ROBERT ABBE, M.D., President, in the Chair.

ANKYLOSIS AT ELBOW IN EXTENSION FOLLOWING FRACTURE AND UNREDUCED DISLOCATION; ARTHROTOMY.

DR. CHARLES A. POWERS presented a boy, nine years of age, who had been brought to him for treatment six weeks after he had sustained an injury at the left elbow. The patient's forearm was held in complete extension by ankylosis at the elbow where there was considerable callus, and a backward dislocation of the ulna. After arthrotomy the callus was chiselled away; the coronoid process of the ulna was broken off and turned up into the sigmoid cavity, lying between the olecranon and the lower end of the humerus; after the removal of this detached process the reduction of the dislocated ulna was easy; the wound was closed without drainage; uncomplicated healing occurred; at the end of five weeks, when dressings were dispensed with, motion at the elbow through an arc of ten or fifteen degrees was possible; at the end of four months, when the patient was presented, there is possible flexion to about a right angle, and extension to about 150°.

DR. POWERS raised the question whether treatment of fractures at the elbow in the position of complete extension is ever proper. He reminded the Society that Allis, of Philadelphia, had urged the method of treatment in extension strenuously, and a year or two ago, Dr. Roberts, of the same city, had written an article upon the subject. It seemed to him that the method is not to be recommended to the general practitioner, or those who are not in the habit of seeing a great many cases. Within the last two years two cases had come under his observation where fracture at the elbow had been treated in complete extension with the result of almost entire disability, so that in both cases arthrotomy had to be performed.

DR. GERSTER took exception to the criticism passed by Dr. Powers upon the method of treatment by fixation in extension. Not that he was an advocate of this method, but because the case related, and others more or less like it, prove that the patient would have been just as badly off had the arm been put up in the flexed position. As long as reduction of the fragments which have been displaced has not been effected, the manner in which the dislocated member is put up has little to do with the result. The result is bound to be a bad one, and therefore to pass criticism upon the position alone is not proper. He believed that every one of the different forms of treatment could give good results when applied in suitable cases. On the other hand, he was convinced that there are a number of cases of injury of the elbow-joint in the treatment of which good results will not be obtained either in the flexed or extended position. That it is especially true when the case comes late to the surgeon, who finds great swelling and conditions in which it is impossible to determine the extent of the injury and of the displacement of the fragments. There is then but one reliable way, namely, to cut down, ascertain the exact condition of things and correct it. He was reminded of several cases in his own practice, in which fracture of the elbow had been diagnosed, in some the limb having been fixed in extension, in others in flexion, with a satisfactory result so far as this was possible with fixation, but in at least two cases he had cut down and found the trouble to be due less to fracture than to dislocation. This mistake in diagnosis, mistaking dislocation for fracture, is, he believed, not infrequent.

DR. MCBURNEY remarked that those who recommend the straight position in the treatment of these injuries are bound to prove that their method possesses distinct advantages, for other things being equal we may fairly insist upon the propriety of putting the limb up in that position, in which, should ankylosis take place, it will be most useful. We see constantly limbs treated in a position for which there has been no particular excuse except that it has been voluntarily assumed by the patient. In rheumatism and other diseases of the joints, as well as after injuries, the limb can be treated in a position in which, should ankylosis follow, it will be very useful. On the other hand, if the knee were fixed with the leg at a right angle with the thigh, the limb would be practically useless in the event of ankylosis. From experience on the living and dead subject, he was satisfied that the best results are obtained when the arm is put up in the flexed position at an angle a little less than a right angle.

DR. WILLY MEYER said that several years ago Dr. Powers recommended treatment of fractures at the elbow with the arm flexed at a right angle, leaving the splint on three or four weeks. He stated he had seen excellent results from this procedure. He had treated one case of fracture of the external condyle without dislocation in that manner, and he knew that ankylosis ensued. He believed that the best treatment is not fixation, for so long a time in either the flexed or extended position. The best method seemed to him still to be the old one recommended and practiced by the late Professor Busch, of Bonn, who put the limb up for ten days in the position of about 120°, then flexed it to a sharp angle, and thus retained it for another ten days. On the twentieth day after the accident the arm is stretched to 180°, very gently and, if necessary, under anæsthesia. On the twenty-eighth day the last splint is removed and the patient made to use his arm. But also after this treatment now and then a certain amount of stiffness remains.

DR. ABBE said that only the day before he had seen a case in which a dislocated elbow had been dressed in the straight position by an able physician. The tumefaction was so great that the real condition of the injury could be determined only under ether. Reduction was easily effected. He was convinced then, as he had often been before, that the frequent advice that surgeons treat injuries of the elbow with the arm put up in the extended position, should be corrected, for it seemed to him a most dangerous and unscientific method of treating fractures or dislocations at the elbow.

DR. POWERS thought that if the general practitioner were taught to put the arm up at a right angle it would be much safer than to put it up in the extended position. It was not so particular, however, whether the angle were a right angle or a little greater. He had of recent years had no case in which ankylosis had taken place after treatment conducted by himself.

LATER CONDITIONS OBTAINED BY WITZEL'S METHOD OF GASTROSTOMY.

DR. WILLY MEYER presented again the man whom he had shown at the May meeting [1] of the Society, in order to illustrate the result of gastrostomy by Witzel's method, seven and a half months after

[1] ANNALS OF SURGERY, November, 1893, p. 555.

the operation, which had been performed on April 13. The case showed the success of this method of feeding through an opening into the stomach, without regurgitation or leakage of food. At first, the canal through which the tube was introduced traversed the abdominal walls very obliquely, but with the lapse of time the external and internal openings had approximated each other until they were nearly in line, yet leakage had not taken place. The tube was removed for demonstration, and the patient then ordered to cough as hard as he could. He had been fed about two hours before. The canal proved absolutely closed. It was impossible to state the exact pathological character of the stricture of the œsophagus. Originally it had probably been syphilitic, but it was not unlikely a malignant element had become engrafted upon it. There was a history of syphilis having been contracted thirty years ago, and of intermittent œsophageal stricture the past three and a half years.

BILATERAL DISLOCATION OF THE INFERIOR MAXILLA OF 136 DAYS' STANDING.

Dr. Charles A. Powers presented a young woman, seventeen years of age, who awoke, January 4, 1892, to find that her mouth was open, and that she was unable to close it. She had had toothache a day or two, but was not conscious of the jaw having slipped out of place. Directly afterward she went to a number of dentists, but they were unable to do anything for her. At the end of 136 days she was brought to him. He found a forward dislocation of the lower jaw to be present; the incisor teeth could not be brought within a centimetre and a half of each other. On May 19, 1892, while the patient was under the influence of ether, a speculum was placed between the posterior molar teeth, and forced open, a piece of wood was introduced, and by manipulation, extending over about twenty minutes, the dislocation was finally reduced. The lower incisors, however, still rested a little in front of the upper, due, apparently, to slight thickening in the glenoid fossa. A plaster-of-Paris bandage was applied, and left on for four weeks, the patient being fed meanwhile through the nose. The splint was then removed, restoration of function commenced, and is now complete. The luxation has not recurred.

After a casual glance over the literature he had been unable to find a case of reduction by manipulation after so long standing. The longest found was 100 days.

EXTENSIVE DESTRUCTION OF FACE BY CARCINOMA; ARRESTED BY OPERATION; DEFORMITY RELIEVED BY ARTIFICIAL NOSE.

DR. WILLY MEYER presented a woman who had come under his care for extensive malignant disease of the face, at the Skin and Cancer Hospital, about one year previously. A large ulcerating epithelioma of eighteen years' standing then occupied the entire nose, the inner half of the right eyelids and conjunctiva, a large portion of the right cheek and part of the upper lip. To save the left eye, the growth was cut out within healthy tissue. Then meta- and cheiloplasty was done by turning down a large flap from the right temple. It covered the eviscerated orbit, and reached to the border of the apertura nasi. The secondary defect was at once grafted upon according to Thiersch. Of course, there was no material in the patient's face for rhinoplasty. Everything healed nicely. After proper time had elapsed the second part of the operative plan was carried out. Dr. Tetamore, of Brooklyn, an expert in making facial protheses, was consulted, and he made of papier-maché a very good artificial nose, with an attachment to cover the portion of the flap, which occludes the orbit. On it an eye is painted. The entire apparatus is fastened on a pair of spectacles, which is held by a rubber-cord around the occiput. The patient's appearance is almost natural. The case well demonstrates that even such far-advanced cases can be successfully operated upon, also with a good cosmetic result, if we make use of such an artistically worked-out facial prothesis.

OPERATIONS FOR TOTAL PROLAPSUS OF THE UTERUS AND RECTUM.

DR. KAMMERER showed a case of a woman of thirty-six, who had suffered from total prolapsus of the uterus, and of the rectum. The operations were done in two terms: First, the rectum was operated upon by Roberts' method; the rectum protruded from the anus for about five inches, could be easily replaced, and when in this condition, the entire hand, excepting the thumb, could be easily introduced into the bowel. There was no action of the external sphincter. An incision was carried in the middle from the coccyx to the anal orifice, and the operation was further done in the same manner as the one described at the meeting of this Society of October 28, 1891. This

time two-thirds of the sphincter was excised, which was four inches long, and was the base of a horseshoe-shaped excision of the posterior rectal wall, measuring five inches in length. As in his previous case the rectal wall was sutured with a running catgut suture, and the superincumbent soft parts with catgut, and finally with deep silkworm-gut sutures. At the point of the coccyx a small piece of gauze was pushed underneath the latter, and removed after several days, when primary union seemed sure to occur. After eight days the bowels were carefully moved with oil and water. About six weeks later abdominal hysterorrhaphy was done, and the uterus attached to the anterior abdominal wall by three silkworm-gut sutures. The patient also made an excellent recovery from this. The speaker had lately seen the patient operated on two and a half years ago, and he had had no recurrence of his old trouble. The patient shown to-day had been up for two months, and had had no return. Her bowels are moved every day without enemata. There seems to be no power over the external sphincter, a condition which was well marked before the operation, but the patient has suffered no discomfort from this.

The speaker knew of four cases: One of Dr. Roberts', one of Dr. Bell, and his own two. In all the results had been very gratifying. The operation was one attended with considerable hæmorrhage in large prolapsus, and was one that demanded careful preparation of the patient, and accurate suturing, but it seemed to compare favorably with the other methods for prolapse.

EXTENSIVE SARCOMA OF THE SUPERIOR MAXILLA; NO RECURRENCE THREE YEARS AFTER REMOVAL.

DR. CHARLES MCBURNEY presented a woman, fifty-three years of age, from whom, in November, 1890, he had removed a malignant tumor of the left upper jaw, which had caused the cheek to project prominently. The skin was discolored from tension. The left hard palate had entirely softened, so that a needle could be thrust through it at any point. The left nostril was full of vascular, readily bleeding tissue, and there was more or less prominence beneath and external to the malar bone, showing that the disease extended well out in that direction. The diagnosis was osteo-sarcoma of the upper jaw. The growth was exposed by an incision

along the nose, through the lip and under the eye. The disease proved to be so extensive that the incisions were necessarily very free. The whole left upper jaw was removed, together with most of the bony floor of the orbit. The diseased tissue extended beneath the malar bone and a considerable distance beyond it. All recognizable diseased tissue was removed. Recovery from the operation, however, was excellent, and the patient had remained absolutely free from any sign of recurrence. The tumor was examined and pronounced to be an osteo-sarcoma of the round-celled variety.

Curiously enough, the patient, who was treated for a long time by a specialist for ordinary polypi of the nose, has recently developed an ordinary mucous polypus in the other nostril.

HÆMORRHAGE DURING STAGE OF REACTION IN A WOUND MADE FOR LIGATION OF THE SUPERFICIAL FEMORAL ARTERY.

DR. ARPAD G. GERSTER presented a patient, the chief interest in whose case, he stated, centred in the peculiar history following operation. The patient, a man, twenty-seven years of age, was admitted to the German Hospital in July, 1893. Aside from the fact of a very well-pronounced aortic insufficiency and regurgitation, and very well-pronounced atheroma of all the vessels, there was found at the middle portion of the calf a rather large pulsating tumor, which could not but be diagnosed as an aneurism of the posterior tibial artery. As the skin over the tumor was changing in color, and the tumor itself was painful, operative interference was advised to prevent rupture of the aneurism, which was threatened. On July 6, deligation of the superficial femoral artery in Scarpa's triangle was done. As before the operation, on pressure, so after deligation of the artery, the pulsation in the tumor ceased immediately, and inasmuch as the patient's vessels were so very brittle, ordinary ligature in continuity was not deemed sufficient, but two ligatures an inch distant from each other were applied, and then the artery was divided between them, permitting both ends of the artery to retract. The hæmorrhage during the operation was unusually slight, so that not a single artery forceps had to be used. The wound was so dry that closing it by suture, without providing for drainage, was considered admissible. The limb did not show disturbance of the circulation immediately after the operation ; it did not become cold, and

it was treated just as usual by elevation and cotton wrapping. On examining the dressing the next day it was found that blood in considerable quantity was oozing from the wound. The circumference of the thigh had increased considerably, causing marked distention. The fine catgut sutures had given way, and the wound was filled with fresh blood-clot, while serum was oozing out in considerable quantity. The excitement of the entire circulatory system of the patient was at that time so pronounced that the pulse in the small arteries was very distinct, while that of the external femorals was enormous. Apprehension was felt, therefore, that a ligature had cut through, and that secondary hæmorrhage was imminent. Yet as no hæmorrhage was going on at that time, Dr. Gerster contented himself with applying an elastic ligature above, as high up as possible, leaving it loosely *in situ*, and putting an extra nurse to watch the patient continuously, with instructions to tighten the ligature in case hæmorrhage should recur. All apprehensions as to the possibility of secondary hæmorrhage were not quieted, however, until a fortnight after the operation. It is well known that as to secondary hæmorrhage the time of greatest danger is about the tenth day, and as trouble was confidently expected it was decided to inspect the wound on the seventh day, and, in order to be prepared for any emergency, the patient was anæsthetized while the clot was being cleared away from the wound. The pulsating impulse of the stumps of the artery was then observed, but nothing was found indicating immediate danger of hæmorrhage. Dr. Gerster was very glad not to be compelled to interfere, since, if the artery had been deligated higher up, there would have been liability to recurrence of the same danger. The swelling of the limb, which was due to infiltration of the subcutaneous and intermuscular tissues with blood, gradually diminished, the blood became absorbed and the patient made an excellent recovery. The aneurism ceased to pulsate, and the patient was discharged cured August 23, 1893.

Dr. Gerster emphasized the fact that within a few hours after ligating the femoral artery considerable arterial hæmorrhage took place into the wound. It can be safely assumed that this hæmorrhage did not take place from the severed arterial trunk either at its proximal or distal end. Had it been from the stump there is no doubt it would have been a great deal more violent than it was, and probably fatal. As not a single vessel bled during the operation, the subsequent hæmorrhage could not have taken place from any

vessel cut at that time which might not have been tied, so that it does not seem probable that it came from a small atheromatous vessel from which a thrombus was thrown out during the excitement of the vascular system following the operation. Since apparently not a single small vessel was injured by the knife, there is no choice but to assume that the hæmorrhage must have taken place from one of the vasa-vasorum.

Dr. McBurney remarked that it did not seem to him that in the history given there was sufficient ground for reaching the conclusion that the hæmorrhage had come from the vasa-vasorum. He saw no reason why the hæmorrhage could not have come from divided blood-vessels in the superficial parts. These vessels, not having had to carry much blood, could very easily hold a small thrombus until the main current having been shut off in the femoral, the pressure upon the anastomotic channels became stronger and stronger and the thrombi in the smaller vessels were driven out and bleeding ensued.

Dr. Gerster rejoined that his conclusion was not a positive one. He should have said that when he incised the vessel a little hæmorrhage took place from the sheath, and inasmuch as the clot which was found afterward extended down to the bottom of the wound he suspected—and that is all he wished to put upon record—that the hæmorrhage came from the vasa-vasorum. But, of course, the explanation which Dr. McBurney makes is plausible—that some small vessel was cut which did not bleed at the time of the incision, but which did bleed subsequently.

GANGRENOUS CHOLECYSTITIS, WITH REPORT OF A CASE.

Dr. L. W. Hotchkiss read a paper upon this subject (see page 197).

Dr. Gerster said that, although he had never had an opportunity of observing gangrenous empyema of the gall-bladder, he had seen two cases of acute suppuration of the gall-bladder, in both of which there must have been in existence a chronic inflammatory process before the acute one was set up. One occurred in an elderly man who had been suffering from chronic bronchitis many years, which caused him to cough a great deal. All this time he had complained to his family physician of a pain located in the right side of the abdomen. After having suffered a long time from these indistinct

pains caused by coughing, he suddenly fell ill with very high fever and symptoms of peritonitis. Dr. Gerster having been called in, found in the right hypochondriac region a very distinct globular tumor, painful on pressure. An incision was made and an enormously-distended gall-bladder was exposed. While this was not then gangrenous, he had no doubt that, but for interference, such a condition might have soon developed. Only one stone was found, which was impacted in the cystic duct, and some difficulty was experienced in dislodging it. It was evident that the stone had been free in the gall-bladder, during which time the man had only suffered from colic of cholecystitis, but as soon as it had entered the duct the symptoms took on a serious turn owing to retention and the development of abscess of the gall-bladder.

The second case occurred in a woman. A number of stones were found in the gall-bladder, one rather large one being impacted in the cystic duct. In this case, as in the first one, the walls of the gall-bladder were very thick, indicating that a chronic inflammatory condition must have existed a long time before the stone became impacted in the cystic duct and gave rise to acute suppurative inflammation. He believed these cases to be exceedingly dangerous, and to require prompt surgical interference.

Dr. Willy Meyer said that during the last summer he was called by a colleague to see a lady, fifty-four years of age, who had suddenly been taken sick with an acute intra-peritoneal trouble four days before. At first it had seemed to her physician that the case was one of appendicitis. But more pain soon developed at the seat of the gall-bladder, the temperature rose to 103°, the pulse to 112, and considerable tympanites developed. On making an incision along the border of the right rectus muscle the gall-bladder soon came into view. It was not much distended, but a number of abscesses presented themselves in its highly-inflamed walls. The case was one of acute empyema of the gall-bladder and phlegmon of its walls. A deposit of thin pus was found in the adherent omentum. It was carefully mopped away. The gall-bladder did not project from the abdominal incision, and it was only with great difficulty that, after tapping and aspiration, a portion of its upper surface was lined with peritoneum. At two spots, where the purulent deposits in the wall were especially marked, tampons of iodoform gauze were introduced into the peritoneal cavity. Then the bladder was incised, a number of small stones removed and drained. Probing of the cyst and

common ducts showed no obstacle. On the second day after the operation bile flowed freely out of the incision. There had never been jaundice.

The patient died on the fourth day after the operation of progressive peritonitis.

In this case, as in another similar one which lately came under his observation, there had been considerable pain at McBurney's point, which might have led one to make a diagnosis of appendicitis, but on deep pressure the fact was brought out that the seat of greatest pain was located in the region of the gall-bladder.

DR. MCBURNEY had never seen gangrenous cholecystitis, although he had operated a number of times on the gall-bladder. He hardly knew how to explain the fact that it is not met with oftener, since in the case of the vermiform appendix gangrenous inflammation is not at all infrequent. He suggested as an explanation the density, toughness and non-vascularity of the gall-bladder walls. In the case of the appendix the opposite conditions prevail—the walls are often not hardened by old disease, but are soft and vascular, and the vessels become plugged with bacteria at an early stage. As the active factor in the case of the gall-bladder we have interference with drainage, and in the case of the appendix also absence of drainage, but in addition the rapid multiplication of bacteria.

DR. ABBE said that extreme toughness of the walls of the gall-bladder is hardly universally prevalent. The bladder walls have their various layers—mucous membrane, cellular, muscular and peritoneal —which frequently become the site of phlegmonous inflammation. A striking illustration of this he had seen in a lady who, twelve hours before he saw her, was taken with a very acute attack of phlegmonous inflammation of the gall-bladder, the viscus containing about two tumblersful of fluid and seventeen stones. As soon as it collapsed after puncture the different layers of its wall could readily be made out, the cellular layer permitting the muscular and mucous layers to freely slide upon each other. It would seem, then, that usually there is less disposition in the inflamed gall-bladder to choke off the circulation in its arteries than is seen in the appendix, for example, where the one supplying artery being obliterated gangrene follows. But in Dr. Hotchkiss' case there was an abnormal circular constriction and lymph infiltration, which, it would seem, was sufficient to choke off the circulation from that extremity of the viscus. It must be a very rare condition, else more cases of gangrene

of the gall-bladder would have been seen among the numerous cases which have of recent years been operated upon. It seems unwise to burden the nomenclature of liver surgery with the name "gangrenous inflammation," which has not been known to occur except in this one illustration in an anomaly. He had had occasion to operate in another case of acute suppuration of the gall-bladder, there having been a cancerous nodule in the common duct which caused obstruction and inflammation. In that case the entire walls of the bladder were thickened and suppurating, but no sign of gangrene was present.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, November 6, 1893.

DR. WILLIAM HUNT, President, in the Chair.

OPERATIVE TREATMENT OF CLEFT PALATE.

DR. J. EWING MEARS discussed the treatment of *Cleft of the Hard and Soft Palates*, saying that in an experience extending over a period of twenty-five years he had treated by operative procedures upward of 100 cases of deformities of the palate. These cases had included all forms of congenital and acquired cleft—deformity limited to the soft palate, partial and complete in its extent; of the hard palate—partial and complete, including involvement of intermaxillary bone, and the upper lip, with either single or double cleft. With regard to the cleft of the soft palate, he had observed that in nearly all cases of complete cleft there had coexisted a cleft in the hard palate, implicating to a slight extent the horizontal plates of the palate bone. This condition has an important relation to the success obtained in effecting closure, as further noted when discussing operative measures.

Of acquired cleft he had met with various forms—from simple perforation, by a small opening, to almost entire obliteration of the soft and hard palates, with destruction of portion of the osseous structures of the nasal cavities. In one instance there was not only a fissure in the median line, but the lateral portions were united by firm adhesions to the posterior wall of the pharynx.

In congenital cleft of the hard palate he had met with instances in which the fissure being bilateral there was more or less deficiency of the vomer, and in other cases the fissure being limited largely to one side, the vomer, somewhat deflected, had been found in articulation with the side less involved, thus permitting communication between one nasal fossa and the oral cavity only.

The conditions presented by persons the subject of cleft palate, are defective articulation, defective deglutition, and, as a rule, more or less chronic inflammation of the nasal and pharyngeal spaces. These conditions vary in degree in accord with the extent of the lesion, but he had observed as great an involvement of articulation where a slight notch only existed in the uvula as where both soft and hard palates have been fissured. The important function of the velum is, by its approximation to the posterior wall of the pharynx, to shut off the cavity of the mouth from the cavity of the nose, so as to prevent the passage of sounds and of food into the latter during articulation and deglutition. The muscles of the velum control by their action the opening and closing of the posterior nasal apertures, as those connected with the nasal cartilages regulate the opening and closing of the anterior nasal apertures. In cases of palate fissure in adults he had observed the use made by the anterior muscles in the effort to do the duty of the velum in so narrowing or contracting the anterior nasal openings as to prevent the escape of sounds or food. The chronic inflammation which exists in cases, as a rule, of extensive fissure, is due to the exposure of the parts to the effect of the air which comes directly in contact with the surfaces without passing through the recesses of the normal nasal fossæ.

The object to be accomplished by treatment is to close the clefts. This can be done either by the adaptation of artificial appliances—obturators—or by operative procedures—staphylorrhaphy, when upon the soft palate; uranoplasty, when upon the hard palate. Since the introduction of these methods each has had its period of employment. Discouraged by the failures to obtain perfect results by operation, artificial appliances came into vogue and were employed to the exclusion of operative measures. These, failing to satisfy the requirements and especially failing to give comfort to the patient, lost favor and a revival of operative methods has occurred. In his experience he had never found the use of the obturator in cleft of the soft palate satisfactory. In cleft of the hard palate alone he had frequently advised its employment, where the rudimentary palatal processes had been so narrow as to forbid operation, or where the opening was not very large. In some cases, in adults, of cleft of soft and hard palates, he had closed the soft palate by operation and had adapted to the opening in the hard palate an obturator. In children, he always advised closure by operation.

He had operated at various periods of life—from three years to

fifty. He advises operation at an early age in order that the growth of the parts may be facilitated, and that the education of the child may receive proper attention. In paring the edges of the cleft he secures as large a raw surface as possible in order that the union may be strong. Having tried many forms of needles and varieties of sutures, he had found the simplest the best. The instrument employed consists of a handle to which needles of various curves can be securely fastened. Silver-wire sutures of medium size are used, a strong linen thread, double, being first deposited and the wire suture hooked into the loop and drawn through; the suture is deposited on one side at a time. The needle is introduced some distance from the edge so as to include a sufficient amount of the tissue to hold the edges firmly in apposition without tension. When the sutures are all in position the edges are brought together and the muscles divided as may be necessary to relieve all tension. The tensor palati is divided near to the hamular process, and the palato-glossi and palato-pharyngei as low down as they can be reached. In his later operations he has removed the sutures earlier, beginning on the fifth or sixth day to remove those affording the least support and completing removal by the seventh day. This plan has given better results. Liquid food, milk chiefly, is administered by a spoon, whilst the sutures are in position. The patient gradually returns to the use of solid food.

In operations upon the hard palate the method of Sir William Ferguson has been latterly employed, having failed by other methods to secure good results. The steps of the operation consist in freshening the edges, depositing the sutures through the openings made with the drill in the bony processes, division of the processes by the chisel or saw, drawing of the segments thus formed to the middle line, and securing them in place by twisting or shotting the wire. The section of the bone should be made so as to avoid wounding the vessels and nerves which come into the oral cavity through the posterior palatine canals, and which lie in a groove at the base of the alveolar process. Division of the soft palate downward is necessary to bring the segments in position without undue tension. The cavities formed by the transplantation of the segments are plugged with iodoform gauze, 5 per cent., which affords support and controls hæmorrhage. On the third day the plug is removed, and as the spaces close they are gradually reduced in size.

End-results. As to operative procedures on the soft palate. If careful examination has been made to detect the slight notch in the

hard palate and the bone has been divided, union in entire extent has occurred. In cases of long uvula non-union has sometimes occurred at the very tip. This has been remedied by subsequent operation on the end; if the length permits, cut off.

As to the hard palate. In certain cases slight necrosis of portions of the segments, caused by splintering at the time of section, has occurred and the pieces removed. This has not interfered with the reparative process. In one instance the space on one side, left after drawing segments to the median line, was so large that it did not close completely—an obturator was successfully adapted.

As to the restoration of function. In all cases deglutition has been markedly improved, rendered perfect except in a few instances of short and rigid vela in which hasty and careless efforts at swallowing are accompanied by the passage, especially of liquids, into the nasal cavities.

The improvement in articulation has varied greatly, and the improvement has depended largely upon the size and conformation of the faucial and pharyngeal spaces. In a few it has been complete. In many the improvement is partial but progressive, especially in children where pains are taken to educate them properly. In some cases where he had been able to retain charge of the patient he had rendered assistance, as growth took place, by subsequent division of the palate muscles, thus increasing the movement of the velum.

In all cases, children and adults, the effect upon the *morale* has been good, and for this reason, if no other, the operation is justified.

MULTIPLE CYSTOMAS OF THE LIVER TREATED BY INCISION AND EVACUATION.

Dr. John B. Roberts related the case of a German woman, fifty-six years of age, who was admitted to the Woman's Hospital on October 2, 1893. For ten years she had noticed a swelling in the right side of the abdomen below the ribs, which for about one year had been somewhat painful. She had always been a healthy woman, and had borne seven children. The menopause had been established ten years previous to her admission. One week before entering the hospital she began to suffer with dyspnœa and cough, accompanied by constipation and fever.

On admission, in the abdomen was discovered a large mass occu-

pying the greater part of the right hypochondriac and lumbar regions. The tumor was irregular in outline, and near the middle line presented a particularly marked elevation, which was elastic on pressure, and gave the examiner the impression that it was a cyst. The woman was not jaundiced, and her bowels were moved freely after the administration of Epsom salt and an enema.

On October 20 he made an incision some four inches long in the median line, extending from a point near the ensiform cartilage downward to one a little below the umbilicus. The incision uncovered that protuberant portion of the tumor which was conspicuous before operation was undertaken. This was evidently a cyst occupying the right lobe of the liver immediately below and to the right of the suspensory ligament. By inserting the hand into the peritoneal cavity, it was there found that both the right and the left lobes of the liver were occupied by numerous cysts, varying in size from an inch to four inches in diameter. The liver, by reason of these cystic growths, was enormously enlarged, and the suspensory ligament extended almost to the umbilicus, because of the growth upward and forward of the upper surface of the liver. The gall-bladder could be felt beneath the enlarged right lobe, and by palpation it was discovered to contain an irregular calculus. There was a little ascitic fluid in the peritoneal cavity. The cysts seemed not to communicate with each other, but to develop independently throughout the substance of the organ.

The prominent cyst over which the incision was made was stitched to the parietal peritoneum by a continuous suture, a temporary dressing applied so as to delay puncture until adhesion with the anterior abdominal wall.

Seven days later he laid open the adherent cyst, and through this other cysts, until some eight or ten cysts of various sizes had been opened, by incising the walls between them. He then cut away the anterior wall of the first cyst, making the opening into it correspond very nearly with the aperture in the parietes of the abdomen.

The irregular cavities left by the evacuation of the cysts' contents were thoroughly washed with hot water, and the whole space packed with iodoform gauze. The patient showed comparatively little shock during the operation, reacted promptly, and continued to do well, until at the end of three weeks she suddenly and unexpectedly died. Upon autopsy the liver was found greatly enlarged,

weighing eleven and a half pounds, and riddled throughout with cysts. The fluid removed from one of the cysts was examined microscopically for echinococcus hooklets, but none were found. Chemical examination showed it to be albuminous—a condition opposed to the theory of the case being one of multiple hydatid cysts.

Both kidneys were found also greatly enlarged and riddled with cysts.

A condition of pleuro-pneumonia, with cardiac thrombi, accounted for death. The reporter had been able to find in literature no case of such extensive cystic degeneration of the liver.

EXCISION IN THE TREATMENT OF SPINA BIFIDA.

Dr. John B. Roberts reported the history of a case of spina bifida which he had subjected to excision of the meningeal sac. The patient was a healthy and otherwise well-formed male child, seventeen days old. The tumor due to congenital deformity occupied the upper portion of the sacrum. It was hemispherical and measured about an inch and a half vertically and horizontally, and was elevated above the surface of the back about one inch. The central portion consisted of translucent tissue upon which was an ulcerated-looking space toward the lower portion of the tumor. This granular or ulcerated condition was present at the time of birth. The normal skin extended up the tumor on each side to a sufficient extent to leave only about half the surface of the hemispherical swelling of translucent tissue. The mass fluctuated on pressure and seemed to increase little, if any, when the child cried. Under the circumference of the tumor on each side could be felt a hard edge which seemed almost like bone, but which was evidently the margin of the muscles of the back or the posterior border of the iliac bone on each side.

A puncture was made on the right side of the tumor above the margin of the skin, and about two drachms of colorless fluid allowed to escape. No symptoms occurred during this evacuation of cerebro-spinal fluid. The collapsed sac was then excised by two curved incisions meeting at a point above and below the protrusion in healthy skin. Six or eight nerves were found attached to the internal surface of the translucent membrane forming the dome of the tumor. These were consequently dissected loose as close to the membrane as possible. On each side of the sacrum in front were seen similar nerves, but of larger size, entering the anterior sacral foramina. These, as

well as the nerves dissected from the sac, came out of an opening at the upper portion of the sacrum which led to the vertebral canal. This opening would not entirely admit the tip of the little finger and was circular, being about three-eighths of an inch in diameter. In this opening lay what was supposed to be the cauda equina, which very nearly filled the entire orifice. This bony opening was situated very close to the upper edge of the external tumor, which had been developed principally below the opening rather than over it. The dura mater was apparently adherent to the internal surface of the tumor wall. The posterior wall of the vertebral canal in the sacral region was absent below the opening mentioned. The anterior sacral nerves were not interfered with, but the posterior ones with the cauda equina, or lower end of the cord, were pushed into, but not through, the bony opening by the finger tip. The youth of the child and the serious character of the operation deterred the operator from undertaking an osteoplastic procedure, and even from interfering with the contents of the sacral opening.

The skin flaps left by the incision of the sac were then brought together over the site of operation by interrupted catgut sutures. No drainage was used and the wound was sealed by strips of gauze saturated with iodoform and collodion. Some bloody oozing from the wound necessitated redressing upon the following day and the insertion of an acupressure pin at both the upper and lower angles of the insertion. Sloughing of the tissue compressed by these pins subsequently took place, with extension of the sloughing process to the rest of the wound flap with pus infection and secondary hæmorrhage, readily controlled by pressure. Beginning the day after the operation and continuing during three days there were convulsive seizures, limited at first to the posterior cervical, occipital and ocular muscles, but later becoming general. By the administration of potassium bromide these were controlled so that none were observed after the third day. On the fifteenth day the infant died from exhaustion due to the hæmorrhage and sepsis. No autopsy.

Dr. Roberts stated that, despite the fatal issue of this case, a study of it, as well as of surgical literature, convinced him that in properly selected cases excision is justifiable, and will be found satisfactory in relieving the disability due to the congenital defect of spina bifida. The injection of the sac seemed to him unscientific because it is really groping in the dark. The conclusion that incision, exposing the contents of the sac, followed probably by excision, is the preferable

method of dealing with bifid spine is confirmed by the results attained in many operations upon the brain and spinal cord.

The securing of a vertebral canal by some osteoplastic procedure would seem to be a very desirable addition to the original operation by excision. It is yet to be determined how much better the condition of the patient is, however, after such attempts at securing a bony closure of the gap. Theoretically, it would seem desirable, but many cases have been satisfactorily cured by operation, in which removal of sac and simple suturing of the skin over the gap in the bone were done.

TUMOR WITHIN THE SHEATH OF THE SCIATIC NERVE.

Dr. Thomas S. K. Morton related the history of a case of sciatic nerve tumor, as follows: The patient was a woman, forty-two years of age. For a year the existence of a small nodule, deeply situated upon the posterior portion of the left thigh, had been known. This had grown slowly at first, but for the last three months with increasing rapidity. It caused little or no discomfort. When admitted to the Polyclinic Hospital, October 3, 1893, it had the shape and size of a large goose-egg, and lay exactly in the course of the great sciatic nerve, midway between the tuberosity of the ischium and the flexure of the knee-joint. When exposed by incision it was seen that the fibres of the sciatic nerve were spread out upon the growth, running around and over it, while the tumor proper was separately enclosed in a capsule within the sheath. The growth was readily separated from the sheath of the nerve in all directions except at points at the extreme proximal and distal extremities, where a few nerve fibres entered and emerged from it respectively. Some small blood-vessels appeared to accompany the strand of nerve substance into the tumor. These fibres having been divided, the growth was lifted out without further difficulty. Upon examining the cavity in the nerve sheath from which it came, it was observed that most of the bundles of the sciatic were in advance of and had been spread out over the external surface of the growth, but that no appreciable injury had been done them with the exception of the few fibres which had necessarily been divided as they entered the tumor. No sutures were applied to the nerve sheath, nor were any ligatures called for. The wound was closed without drainage by alternate deep and superficial sutures and a pad of dressing so applied as to make compression upon the cavity left

by the tumor. The operation was followed for two days by some pain in the whole sciatic distribution, but especially in the region supplied by the external popliteal, but no loss of power ensued. All pain disappeared in forty-eight hours, however, and afterward she had no disagreeable sensations. Upon the seventh day all sutures were removed and absolute primary union throughout was found. On the tenth day she began to walk about, and four days later walked home, apparently as well as ever. Up to this date she has so continued.

The tumor was ovoid in shape, four inches in length and seven in circumference where thickest. At either extremity a few nerve fibres and blood-vessels appeared to enter or take their exit. Otherwise there were neither adhesions nor pedicle. The growth was encapsulated with a tough brownish-colored membrane which brought away small granular portions of the tumor when forcibly separated from it by peeling. The neoplasm proper was of a yellowish-brown color, rather dry, and cut like fibro-fatty tissue. Exactly in the centre of the mass was a cavity, not definitely separated from the growth, which contained about half an ounce of bloody fluid. Most unfortunately, during the preparation of the specimen for further study, it was accidentally destroyed, so that the diagnosis of sarcoma lacks microscopical confirmation.

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THE OPERATIVE TREATMENT OF CLUB-FOOT.[1]

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EVERY surgeon is acquainted with the difficulties that attend the treatment of many apparently simple cases of congenital club-foot. The resistance offered by the gastrocnemius muscle and the plantar fascia is so readily overcome and so easily discernible that one is often induced to give a favorable prognosis in cases where, if due regard had been given to the mobility in the ankle and tarsus, no such favorable view would have been expressed. It is the record of such failures, both in the mechanical and operative treatment, which has led me to investigate the cases operated upon in the Roosevelt Hospital since 1886. Many good results are undoubtedly obtained by mechanical treatment alone in early life, provided the force necessary to correct the deformity can be sufficiently applied, and the ingenious devices for correcting them seem quite sufficient. Yet there are cases in which the mechanical treatment fails to do its work even in children, or where the time to be expended in the treatment cannot be given, through poverty of the parents, not to mention those cases in adults where no treatment has been applied in early life. It is in just this class of cases that the surgeon is called upon to correct the deformity, and the following twenty-five cases belong to this class.[2] In all club-feet a very

[1] Read before the New York Surgical Society, December 13, 1893.

[2] No cases have been used which have not been investigated either by the author or by physicians in their places of residence. During this period, 1886 to 1893, forty-one cases have been treated by operation, but in sixteen no answers were obtained to letters addressed to them. They have, consequently, been discarded.

important and considerable deformity exists in the talus, which is closely wedged in between the malleoli, and is not controlled directly by the muscles passing over it. Its position is alone maintained by its ligamentous attachments. Its relative position is altered according to the degree of deformity. In simple equinus it is rotated upon its transverse axis. In equino-varus of slight degree it is also rotated upon an antero-posterior axis, so that its under surface points towards the mesial surface of the body. In the equino-varus of still severer type it is rotated upon a vertical axis in addition, so that its head and neck are twisted towards the mesial plane of the body. It is not alone in the talus, however, that deformities are found, for the calcaneus, scaphoid, cuboid and semilunar bones contribute very considerably to the production of this compound deformity.

It is on this account that where club-foot is resistant to mechanical means the operative treatment is to be carried on with discrimination as to the bone or bones most involved in its production, so that the operation selected shall be one which will correct the deformity with the slightest injury to the foot.

In the club-foot of the new-born the talus shows a constant and characteristic deformity. Its *neck* is elongated and obliquely directed inward. In the normal foot a line parallel to the outer border forms with the sagittal axis an angle of 38° in the new-born, and of 10.65° in the adult. In congenital club-foot this angle ranges from 49.6° to 64°, and allows greater inversion and supination of the foot. The *body* of the talus is flattened and narrowed posteriorly, resembling a wedge. Its position is that of plantar flexion, and the ankle-joint resembles an amphiarthrodial rather than a ginglymus joint. The *trochlear surface* stretches nearly to the posterior border of the inferior surface, and is smaller anteriorly than posteriorly. The *articular facet* for the *internal malleolus* is scarcely recognizable. That for the external malleolus is situated more anteriorly. The *head* is directed downward, and forms an angle with the axis of the talus of 65°, in contrast with 45° in the new-born.

The calcaneus is rotated in the same axis beneath the talus. Its *tuberosity* is directed against the fibula. Its *processus anterior*

is strikingly enlarged. The superior articular facet is obliquely inclined downward and inward, so that pronation is prevented before the inner border of the foot touches the floor. The *sustentaculum tali*, which prevents supination, is wanting, so that supination may be increased in extent. The *articular surface* for the *cuboid bone* is situated upon the mesial side.

The cuboid bone is quadrilateral rather than triangular in shape, which condition is probably due to the growth of its lateral border where freed from pressure. The *scaphoid bone* lies internally upon the caput tali. Their long axes are parallel rather than at right angles to one another. The leg is often rotated inward and the malleolus of the fibula is found upon a plane anterior to that of the tibia. The internal lateral, the plantar, the calcaneo-fibular and the talo-navicular ligaments are shortened, while those upon the lateral border are increased in length. The muscles are found in their normal position. The only tendon of which the relation is changed is that of the peroneus longus. This is found in a groove upon the outer side and under surface of the calcaneus. When the weight of the body is added to a foot which is already deformed in this manner and the muscles in walking have fully exerted their power, we have produced the deformity existing in the congenital club-foot of the adult and, to a less extent, in the old cases of acquired club-foot. These changes are similar to those in the child, but more marked, and are seen particularly in the new and abnormal facets.

The internal malleolus is less prominent and rounder. A facet is formed between it and the scaphoid or cuneiform bone. The groove for the tibialis posticus tendon is very shallow. The *talus* is long and narrow. Its *trochlear surface* is covered with cartilage only upon its posterior part. The *lateral facets* are unlike. The *fibular facet* is well marked, and is situated near the neck and entirely separated from the trochlear surface. The tibial facet is very small. The *head* of the talus is poorly developed, misshapen, and often shows two facets, of which the external has no cartilage and the internal articulates with the navicular bone and is covered with cartilage. The calcaneus is bent upon its long axis, with the concavity upon the mesial surface. Its

upper articular surface is flattened towards the inner border and is well developed upon the side. The *processus anterior* is longer, higher and prominent externally. The *tuberosity* is raised and stands immediately behind the fibula. Its superior surface is in contact with the posterior border of the tibial articular surface, so that in severe cases the calcaneus seems a part of the ankle-joint. The articular surface for the cuboid is upon the mesial side. The *navicular bone* is a double wedge, the apices of which are seen upon the inner and inferior surfaces. In many cases it is found beneath the internal malleolus and articulates with it by a facet. The *cuboid bone* is displaced inward to an extent equal to two-thirds of its posterior surface. Its sagittal diameter is increased and its superior surface is more convex and prominent. The *cuneiform bones* are altered in position only. The first cuneiform may articulate with the internal malleolus. None of the bones of the foot are of normal size nor compactness. They are fatty and osteoporotic. In the severe cases of club-foot there is a rotation inward not only of the foot, but as well of the knee and leg.

It is customary to consider a club-foot which is to be subjected to any operative treatment under two heads,—viz., the degree of deformity and the causation.

These two conditions decide whether operation should be performed, as well as the severity and kind of procedure and the benefit likely to be derived.

The *first degree* of deformity is represented by a foot which can be readily placed in the normal position and in which the angle between the foot and the leg is greater than 90°.

The *second degree* is represented by a foot which can be reduced less readily and in which the turning of the foot inward is greater. (Tendon and fascial contraction.)

The *third degree* presents a foot in which there is no possibility of a manual correction and in which all the tissues upon the mesial side are shortened.

These three degrees of deformity may exist as congenital or acquired conditions: the former, a primary deformity in the skeleton of the foot; the latter, one dependent upon paresis or

paralysis in the nerves, central or peripheral, or upon inflammatory or traumatic conditions which secondarily lead to the deformities in the bones of the foot.

In detailing the histories time will be saved by describing only their special and marked features in full.

In all cases the Esmarch's bandage has been used and strict antisepsis has been employed. The deeper parts of the wound have been united with catgut, while the skin has been sutured with either silk or catgut, depending largely upon whether the dressing was to be removed in one week to correct some malposition likely to occur or whether the operator was satisfied that the position at the time of operation was perfect.

(*a*) Congenital Talipes Equino-Varus.

Case I.—C. P., two and a half years; December 9, 1886. Family history good. Previous personal history, none of the diseases of childhood.

History of Present Condition.—Talipes equino-varus (double) of the third degree. The soles of the feet turn inward, the heel is raised, and the child walks entirely upon the outer border of the foot. The tendo Achillis is strongly contracted. The astragalus is not prominent anteriorly. The deformity is more marked in the mediotarsal joint than in the astragalus or os calcis.

December 10. Tenotomy of the tendo Achillis.

December 13. Wounds healed; feet held in flexed position; plaster-of-Paris dressing; position of left foot is better than that of the right foot.

December 26. Plaster-of-Paris dressing renewed; better position is secured.

January 10, 1887. Plaster-of-Paris dressing removed; position not satisfactory; equino-varus still present.

January 11. Phelps's operation upon the left foot, with tenotomy of the tendo Achillis; foot placed in as nearly normal position as possible; the equinus is much improved; some varus is still present; plaster-of-Paris dressing.

January 21. Plaster of Paris removed; wounds are aseptic; position is not perfect; plaster of Paris reapplied.

January 31, February 21 Reapplication of plaster-of-Paris dressing; position the same.

February 24. Phelps's operation and tenotomy of tendo Achillis upon the right foot; position of the foot improved, but there is still some varus and equinus.

March 15. New plaster splint; position the same.

April 28. Several plaster-of-Paris splints have been applied to the feet; the position of the feet, however, shows still some varus, and the equinus is not wholly relieved.

May 4. Under ether, Phelps's wrench was used upon both feet; feet are placed in plaster-of-Paris splint; the position is now good; no equinus nor varus is present.

May 28. New plaster splints; when removed varus is present.

June 2. Phelps's wrench is again used; position of feet is almost normal; plaster-of-Paris splint.

August 1. Plaster-of-Paris and water-glass splints have been applied since last operation; patient has been walking since June 30; when the splints are removed the feet are still in a varus position, though the equinus is corrected.

November 11. Since the last account water-glass splints have been used; now shoes and spiral thigh-spring are worn, correcting as much as possible the varus and the turning in of the toes.

December 3. Patient discharged; improved, but with an imperfect result, as the varus was not relieved; flexion of the foot can be carried to a right angle; the os calcis does not show any marked supination.

The account obtained from the parents of this child is not very encouraging. There is still some varus present, though an apparatus for its correction was worn for nearly three years. It is certainly an improvement, though not a complete relief of the deformity. Result imperfect.

CASE II.—B. C., seven years; October 14, 1887. Family history, none obtainable. Personal history, always in good health.

History of Present Condition.—Congenital talipes equino-varus of the right foot of the third degree but of moderate extent; patient walks upon the anterior portion of the foot without difficulty; the foot is supinated and adducted, but principally beyond the medio-tarsal joint; there is a marked prominence of the astragalus in front of the external malleolus; the plantar flexion, supination and adduction cannot be overcome by forcible pressure; there is no evidence of deformity in the other tarsal bones; the calf of the leg is one inch less in circumference than that of the other leg.

October 15. Incision over the prominent astragalus and in front of external malleolus; removal of the head, neck and greater part of the astragalus, including the prominent anterior portion; foot easily replaced in good position; plaster-of-Paris dressing.

November 1. Splint removed; wound healed; splint reapplied.

November 6. Very slight equinus remains, varus corrected; plaster splint and referred to Out-patient Department; patient was treated in the Out-patient Department for four months with shoe.

August 7, 1893. No apparatus has been worn since leaving the Out-patient Department; the varus is completely relieved; the equinus has disappeared; steps firmly upon the foot, with good flexion at the ankle-joint; *result perfect.*

CASE III.—S. S., six years; October 27, 1888. Family history not obtainable. Personal history, always in good health.

History of Present Condition.—Congenital talipes equino-varus of both feet and of the second and third degree; the dorsum of each foot is in nearly a straight line with the anterior surface of the leg; in the left foot the weight is borne upon the outer border and dorsum, while the plantar surface looks backward and upward; the deformity seems to involve both the astragalus and the bones forming the medio-tarsal joint in the left foot; the left foot is more deformed than the right, which is of the second degree.

October 31. Left foot: Usual curved incision in front of external malleolus and over the dorsum of the foot; extirpation of the astragalus; this does not completely relieve the supination and adduction; removal of a wedge, including a part of os calcis and cuboid; reduction of the deformity is easy; three-eighths of an inch of external malleolus also removed, as it impinges upon the os calcis when the foot is brought into position; plaster-of-Paris splint.

November 28. Wound healed; reapplication of plaster-of-Paris splint.

December 3. Right foot: Tenotomy of the tendo Achillis; reduction of the deformity imperfect; slight equinus remains; plaster-of-Paris splint.

December 7. Wound healed; plaster-of-Paris splint.

December 16. Slight equinus remains; plaster-of-Paris splint.

December 21. Plaster-of-Paris splints applied; left foot, no equinus, no varus; right foot, slight equinus; patient discharged improved.

September, 1893. Physician's report: Is able to flex the foot

to more than a right angle, and bears weight upon the whole foot; no varus; has worn no apparatus upon the left foot. Right foot: Equinus has disappeared; no varus present; upon the right a shoe was worn for two years to overcome the equinus and to prevent any varus. Result: Perfect in both feet; but better in left foot, as there is more flexion at the ankle-joint.

CASE IV.—S. W., twenty-two years; May 27, 1889. Family history not obtained. Personal history, always healthy.

History of Present Condition.—Congenital talipes equino-varus of both feet, and of the third degree; markedly deformed; over the proximal extremity of the metatarsal bone of the fifth toe in both feet a large bursa is present; flexion and extension in the ankle-joint of both feet are imperfect; motion is apparently arrested by the astragalus; plantar fascial contraction is moderate in extent; otherwise the foot is one of marked equino-varus.

June 5. Left foot: Usual incision; removal of astragalus and of a wedge, consisting of a part of the os calcis, cuboid and scaphoid bones; tenotomy of the tendo Achillis; reduction of the deformity good; plaster-of-Paris splint.

June 15, 24, and July 18. Plaster-of-Paris splint; healed.

July 25. Right foot: Usual incision; tenotomy of the tendo Achillis; extirpation of the astragalus and of the malleoli of the tibia and fibula; bursa excised; reduction of the deformity is good; plaster-of-Paris splint.

August 4. Redressed; plaster-of-Paris splint; healed.

August 10, 24. Plaster-of-Paris splint upon both feet removed.

August 28, September 20. On crutches with splints.

October 25. Walking without crutches; the right foot is weaker than the left one, but the position in both is good.

November 20. Discharged.

Patient has been seen at irregular intervals since leaving the hospital.

September 9, 1893. The left foot is the stronger; the right foot is weaker in the ankle-joint; the lateral mobility is too great; the position in both feet remains good; flexion and extension at the ankle-joint are rather good; flexion goes to beyond a right angle, extension to about forty-five degrees; compensation at the medio-tarsal joint in the right foot; walks daily about six miles without resting; result may be classed as good.

CASE V.—J. B., twenty-four years; July 20, 1889. Family history not known. Personal history, weak, always anæmic.

History of Present Condition.—Congenital talipes equino-varus of both feet; left foot presents an equino-varus of the third degree, moderate in extent; the varus predominates; the plantar fascia is greatly contracted; the patient walks upon the outer and upper surface of the fifth metatarsal bone. Right foot is in an equino-varus position of the second degree, with the equinus predominating; tendo Achillis and the plantar fascia are firmly contracted; in walking the heel is one inch from the ground.

August 2. Right foot: Fasciotomy and tenotomy of the tendo Achillis. Left foot: fasciotomy and tenotomy of the tendo Achillis; cuneiform osteotomy, including head and neck of the astragalus, parts of the os calcis and cuboid bones; plaster-of-Paris splints.

August 14. Healed; plaster splints.

August 26. Plaster splints; position good in both feet.

September 3. Discharged.

Patient was treated in the Out-patient Department for the right foot for three months.

July, 1893. Result good; no varus in either foot; flexion in ankle-joint to a right angle.

CASE VI.—G. H., eleven years; November 8, 1890. Family history not known. Personal history, always healthy.

History of Present Condition.—Congenital talipes equino-varus of both feet and of the third degree; has been treated with apparatus for seven years, and has had five or six tenotomies; scars in the feet indicate previous fasciotomies and tenotomies of the tendo Achillis and tibialis anticus and posticus tendons; in the right foot the pressure is sustained by the outer margin of the foot; the sole looks inward and backward; the dorsum looks outward; the astragalus presents a marked prominence in front of the external malleolus, and seems to prevent full flexion to a right angle; the plantar fascia is contracted and marked by both longitudinal and transverse grooves. In the left foot the equinus is not marked; the prominence of the astragalus in front of the external malleolus is not so marked as in the right foot; the sole looks inward, the dorsum outward; the plantar fascia presents the same furrows; flexion to a right angle exists; pronation impossible.

November 12. Right foot: Cuneiform osteotomy, consisting of the head of the astragalus, part of the os calcis and cuboid; fasciotomy; position good; plaster-of-Paris splint. Left foot: Cuneiform osteotomy, consisting of the anterior portion of the os calcis; position not very good; plaster-of-Paris splints.

November 24. Wounds healed; plaster-of-Paris splints applied.

December 16. Reapplication of splints; right foot is in good position, except for a very slight varus; left foot is not at all satisfactory; varus is marked.

December 24. Patient allowed to walk with the splints.

January 2, 22, 1891. Reapplication of splints.

January 26. Discharged, to see the effect of the weight upon the left foot.

June 20, 1891. Readmitted to hospital; the condition of the right foot is that of a slight varus; in the left foot the varus is still marked; flexion to a right angle in both feet at the ankle-joint.

July 3. Left foot: Cuneiform osteotomy, consisting of part of the scaphoid, the cuboid, and the os calcis in its anterior portion; replacement of the foot in good position; plaster-of-Paris splint.

July 17. Healed; plaster-of-Paris splints.

July 31. Right foot: Cuneiform osteotomy as in left foot.

August 1. Left foot redressed; plaster-of-Paris splint.

August 16, 23. Right foot redressed; plaster-of-Paris splint.

September 26. Both feet in good position; wears ordinary shoes; discharged.

September 1, 1893. Heard from his physician: Function of the ankle-joint is very good; flexion to a little more than a right angle; extension to about 135°; no splints nor apparatus have been used since leaving the hospital; walks daily four or five miles without pain. The first operations were not extensive enough. This case shows the importance of a sufficient removal to correct completely the deformity at the first operation.

CASE VII.—F. H., seven months; December 24, 1890. Family history not known. Personal history unknown.

History of Present Condition.—Congenital talipes equino-varus of both feet, and of the second degree; the equinus is well marked; supination and adduction are slightly marked.

January 10, 1891. Tenotomy of the tendo Achillis and of the posterior tibial tendons on both feet; reduction of the deformity is easy, but there seems to be some varus remaining.

January 22. Left foot: Healed; plaster-of-Paris splint.

January 25. Right foot: Healed; plaster-of-Paris splint.

February 4, 21. Both feet: Plaster-of-Paris splint.

Left foot has a slight tendency to a varus; right foot is in good position; plaster-of-Paris splints applied; referred to the Out-patient Department on March 2; right foot was treated for eighteen months

in Out-patient Department; result in both feet good; patient heard from September, 1893.

CASE VIII.—A. H., thirteen years; February 27, 1891. Family history negative. Personal history, always healthy.

History of Present Condition.—Congenital talipes equino-varus of both feet and of the third degree; the plantar surface of the foot looks inward and backward and the plantar fascia is strongly contracted; the scaphoid is deformed and is bent inward and below the head of the astragalus; the dorsum of the cuboid bone forms a part of the bony support of the foot; the astragalus is normal, so far as its relation with the tibia and fibula is concerned; the three cuneiform and the metatarsal bones are completely inverted, so that the dorsal surface looks externally and their plantar surfaces internally; the metatarsal bones are folded into a roll, so that the first and fifth are close together; flexion and extension at the ankle-joint can be made in slight extent; marked atrophy of the muscles of the leg; the dorsum of the foot is covered with a thick, callous skin and a bursa.

March 7. Right foot: Tenotomy of the tendo Achillis, anterior and posterior tibial tendons; fasciotomy; removal of the bursa; cuneiform osteotomy, including the anterior part of the os calcis, cuboid, and of the head and neck of the astragalus; reduction of deformity not quite perfect; plaster-of-Paris splint.

March 17. Dressed; healed; plaster-of-Paris splint.

March 24. Position not perfect; plaster-of-Paris splint.

April 2. Left foot: Tenotomy of tendo Achillis; fasciotomy; cuneiform osteotomy, including the head and neck of the astragalus, part of the calcaneus, and cuboid and scaphoid bones; reduction; plaster-of-Paris splint.

April 12. Dressed; healed; plaster-of-Paris splint.

April 24. Right and left foot. Plaster-of-Paris splint; position of left foot is good; position of right foot is not perfect.

May 1. Patient is walking about the ward; right foot is not perfect; there is still a varus position; flexion and extension at the ankle are good in both feet, and in this particular the result may be classed as perfect.

June 1. Walks pretty well, but the right foot is still supinated.

July 1. As the ankle-joint is freely movable, a supra-malleolar osteotomy of the tibia and fibula is done and the varus position is corrected; plaster-of-Paris splint.

July 25. Right foot: Position is good; plaster-of-Paris-splint.

August 25, September 15, October 9. Still in wards; walks well.

November 20. Discharged; walks well on the plantar surfaces of both feet, but the right foot still presents some varus and is not so good as the left foot.

September, 1893. Report from the physician: Patient is working daily behind a plough and has little difficulty in earning his living; both feet rest squarely upon the ground, flexion at the ankle to a right angle; result good.

CASE IX.—H. G., fifteen years; November 22, 1892. Family history negative. Personal history, always healthy.

History of Present Condition.—Congenital talipes equino-varus of both feet and of the third degree; supination of the foot is marked; the cuboid bone is covered by a bursa; slight plantar flexion at the ankle-joint; fascial contraction extensive; deformity seems to be mostly in the astragalus, which is extensively deformed; no great deformity in the other bones; both feet present the same degree of deformity.

December 10. Right foot: Fasciotomy; extirpation of the astragalus; replacement is easy; plaster-of-Paris splint.

December 16. Healed; plaster-of-Paris splint.

December 18. Left foot: Fasciotomy; extirpation of the astragalus; replacement easy; plaster-of-Paris splint.

December 27. Left foot: Healed; plaster-of-Paris splint. Right foot: Plaster-of-Paris splint.

January 7, January 26, February 11, 1893. Both feet: Plaster-of-Paris splints.

February 16. Allowed to walk.

February 21, March 16. Plaster-of-Paris splints.

March 29. Plaster-of-Paris splints; discharged.

August, 1893. Position in both feet is good; no tendency to a varus; flexion at the ankle-joint to beyond a right angle; result perfect.

CASE X.—Y. N., three years; September 7, 1892. Family history negative.

History of Present Condition.—Congenital talipes equino-varus of the right foot and of the third degree; the varus is well marked; the equinus is slight; the patient walks upon the outer border of the foot, upon which is a callosity; the deformity is in the medio-tarsal joint.

September 9. Tenotomy of the tendo Achillis; fasciotomy of

the plantar fascia; cuneiform osteotomy, including portions of the os calcis and cuboid bones; dressed; plaster-of-Paris splint.

September 12, September 21. Dressed; plaster-of-Paris splint.

October 3. Plaster-of-Paris splint; position is good, slight inversion of the foot.

October 23. Plaster-of-Paris splint; result good, except for inversion, which is slight.

August, 1893. Patient was seen and position is good; no splint has been worn; flexion at the ankle-joint to a right angle; result good.

CASE XI.—H. B., eight years; January 22, 1892. Family history negative. Personal history, always healthy.

History of Present Condition.—Congenital talipes equino-varus of both feet and of the third degree. Right foot: Sole of foot looks inward and upward; point of pressure over the external surface of the displaced astragalus and os calcis. Left foot: Sole looks inward and backward; point of greatest pressure, os calcis anterior extremity; the right foot is more markedly deformed than the left; motion at the ankle-joint is good; flexion to a right angle; extension in small amount.

February 12. Right foot: Tenotomy of tendo Achillis; excision of bursa over os calcis and astragalus; cuneiform osteotomy, including the head of astragalus, a portion of the os calcis, the cuboid, a portion of the scaphoid; dressing; plaster-of-Paris splint.

February 15. Healed; plaster-of-Paris splint.

March 2. Left foot: Same operation, but smaller in extent.

April 18. Healed; plaster splints to both feet.

April 30. Plaster-of-Paris splints removed; left foot in good position; the right foot in slight varus; discharged; treated in Out-patient Department, with brace for right foot, for six months.

October, 1893. Left foot: Flexion at ankle is good; no varus. Right foot: Flexion at ankle is good; the ankle-joint is a little loose; the varus, when walking, exists in very slight degree; result good.

CASE XII.—I. K., seven years; January 7, 1892. Family history negative. Personal history, always healthy.

History of Present Condition.—Congenital talipes equino-varus of both feet and of the third degree; the equinus is slightly marked; supination is marked; the sole looks backward and upward; point of pressure is the extremity of the os calcis, which is covered by a bursa; patient also presents a cleft palate.

January 9. Right foot: Excision of bursa; cuneiform osteotomy,

including head of the astragalus, portion of os calcis, and the scaphoid and the cuboid; tenotomy of tendo Achillis and fasciotomy; replacement of the foot is easy; plaster-of-Paris splint.

January 15. Plaster-of-Paris splint; position of foot is good.

February 4. Left foot: Same operation.

February 8. Plaster-of-Paris splint applied; position is good in both feet.

March 16. Operation upon the cleft palate.

March 23. Died.

The immediate result upon this case was a good one. The examination of the feet after death showed a perfect fitting of the sides of the wedge and no infection. Death was due to the operation upon the cleft palate, and in no way was connected with operation upon the feet.

CASE XIII.—J. A., thirteen years; May 31, 1893. Family history negative. Personal history, always in good health.

History of Present Trouble.—Congenital talipes equino-varus of both feet and of the third degree; had previous treatment with apparatus for three years; both equinus and varus are very marked; no movement at the ankle-joint; right foot: astragalus is prominent in front of external malleolus; the movement of flexion is not perfect; the greatest deformity seems to be in supination of the os calcis and at the medio-tarsal joint.

June 2, 1893. Tenotomy of tendo Achillis; fasciotomy, cuneiform osteotomy, including head of the astragalus, part of os calcis, scaphoid and cuboid bones; replacement easy; plaster-of-Paris splint.

June 17. Healed; plaster-of-Paris splint.

June 26. Similar operation upon the left foot, which presents exactly the same deformity in the bones.

June 29. Right foot: Plaster splint.

July 14. Left foot: Healed; plaster splint.

July 26. Both feet: Plaster splints.

August 18. Allowed to walk in the splints; the left foot is not so good as the right; the os calcis is still supinated to some extent.

August 28. Referred to Out-patient Department for apparatus; patient could not obtain the apparatus, and in consequence an increase in the deformity of left foot; the right foot is not correct, as the flexion at the ankle-joint is not quite that of a right angle.

November 4. Readmitted to the hospital; the right foot presents a satisfactory result, but not a good one, as the leg cannot be brought forward to a right angle with the foot, though the deformity

in the foot is corrected; in the left foot the same trouble exists, together w th an unrelieved supination of the os calcis. Extirpation of the astragalus and half an inch of external malleolus in both feet; plaster-of-Paris splints.

CASE XIV.—J. L., five years; July 3, 1893. Family history negative. Personal history, always healthy.

History of Present Condition.—Congenital talipes equino-varus of the right foot; sole looks inward; supination is marked; the equinus is also marked; the upper half of the tibia is curved, with the convexity backward; the lower half is unusually small; the external malleolus is prominent and bears some of the weight of the body; a bursa covers it; there is considerable mobility in the tibio-fibular articulation (inferior); the leg is two inches shorter than the other leg; it is so rotated that the toes point to the heel of the other foot.

July 11. Fasciotomy; extirpation of the astragalus and external malleolus; replacement; plaster-of-Paris splint.

July 25. Healed; plaster-of-Paris splint.

August 8. Plaster-of-Paris splint.

August 17. Allowed to walk; the foot rests squarely upon the floor, but, owing to the rotation inward of the extremity, it is at a right angle to the sagittal axis of the body.

August 25. Osteotomy of the femur three inches above the condyle; rotation inward corrected; plaster-of-Paris splint.

September 17. Plaster-of-Paris splint.

October 9. Posterior half of the foot is in good position; slight adduction and supination in the anterior half; a shoe to correct or prevent the increase of this deformity is used; result is satisfactory at present and promises to be good (December, 1893).

CASE XV.—J. W., four years; July 12, 1893. Family history negative. Personal history, healthy. Congenital deformities in both hands and one foot; the foot has been treated with apparatus for three years.

History of the Present Condition.—Congenital talipes equino-varus of the left foot; the treatment with apparatus has overcome the equinus; the varus, however, still remains.

July 15. Cuneiform osteotomy including head of astragalus and parts of os calcis and cuboid bones; plaster-of-Paris splints.

July 31. Healed; plaster-of-Paris splints.

August 28. Splints removed; no varus nor rotation inward of foot; result perfect.

December 13. No varus present; motion at ankle good; no apparatus used.

Tabulated Summary.

Variety, and Degree, and Date.	Age.	Result.	When Seen After Operation, or Heard From.	Method of Operation.
1. Talipes equino-varus, double; third degree; December 9, 1886.	2½ yrs.	Imperfect in both.	August 7, 1893.	Tenotomy of tendo Achillis; Phelps's operation; wrench (1 and 2).
2. Talipes equino-varus, single; third degree; October 4, 1887.	7 yrs.	Perfect.	August 9, 1893.	Removal of the head, neck and part of body of the astragalus.
3. Talipes equino-varus, double; second and third degree; October 27, 1888.	6 yrs.	Perfect in both.	September 9, 1893.	Extirpation of astragalus, and cuneiform osteotomy of part of os calcis and cuboid (1); tenotomy of tendo Achillis and apparatus for two years.
4. Talipes equino-varus, double; third degree; May 27, 1889.	22 yrs.	Perfect.	December 13, 1893.	Extirpation of astragalus and part of os calcis, scaphoid and cuboid as a wedge; tenotomy of tendo Achillis (1); one-half inch of the malleoli and entire astragalus; tenotomy of tendo Achillis (2).
5. Talipes equino-varus, double; second and third degree; July 20, 1889.	24 yrs.	Good.	July, 1893.	Fasciotomy and tenotomy of tendo Achillis (1); fasciotomy, tenotomy of tendo Achillis, wedge including neck of astragalus, part of os calcis and cuboid (2).
6. Talipes equino-varus, double; third degree; November 8, 1890.	11 yrs.	Good.	November, 1893.	Fasciotomy; wedge, including part of astragalus, os calcis and cuboid (1); wedge including anterior part of os calcis (2); wedge including more of astragalus, os calcis and cuboid (1); wedge including scaphoid and cuboid (2).
7. Talipes equino-varus, double; second degree; December 4, 1890.	7 mos.	Good.	September, 1893.	Tenotomy of tendo Achillis and posterior tibials (1 and 2), and apparatus for one year.
8. Talipes equino-varus, double; third degree; February 27, 1891.	13 yrs.	Good.	September, 1893.	Wedge including head and neck of astragalus, part of os calcis and cuboid; tenotomy of tendo Achillis; fasciotomy (1) wedge including head and neck of the astragalus, part of os calcis, cuboid and scaphoid; tenotomy of tendo Achillis (2).
9. Talipes equino-varus, double; third degree; November 22, 1892.	15 mos.	Perfect.	August, 1893.	Fasciotomy; extirpation of astragalus (1 and 2).
10. Talipes equino-varus, single; third degree; September 7, 1892.	3 yrs.	Good.	August, 1893.	Tenotomy of tendo Achillis; fasciotomy; cuneiform osteotomy of os calcis and cuboid.

Variety, and Degree, and Date.	Age.	Result.	When Seen After Operation, or Heard From.	Method of Operation.
11. Talipes equino-varus, double; third degree; January 22, 1892.	8 yrs.	(1) Perfect. (2) Good.	October, 1893.	Tenotomy of tendo Achillis; wedge, including head of the astragalus, part of os calcis, cuboid and scaphoid (1); same operation, but smaller in extent (2).
12. Talipes equino-varus, double; third degree; January 7, 1892.	7 yrs.	Good at 2½ mos.	March 22, 1892.	Wedge, including part of astragalus, part of os calcis, one-half cuboid and scaphoid; tenotomy of tendo Achillis; fasciotomy (1 and 2).
13. Talipes equino-varus, double; third degree; May 31, 1893.	13 yrs.	. . .	December 13, 1893.	Wedge, part of astragalus, os calcis, cuboid and scaphoid; tenotomy of tendo Achillis and fasciotomy (1 and 2); extirpation of the astragalus and malleolus (one-half inch) of fibula (1 and 2).
14. Talipes equino-varus, single; third degree; July 3, 1893.	5 yrs.	Satisfactory at present. Good in time.	December 13, 1893.	Fasciotomy; extirpation of the astragalus and external malleolus (one-half inch); femoral osteotomy.
15. Talipes equino-varus, single; third degree; August 10, 1893.	4 yrs.	Perfect.	December, 1893.	Wedge, including parts of os calcis and cuboid.

These fifteen cases represent the severer forms of congenital club-foot, in which twenty-six feet have been operated upon for deformity of the second and third degree, with perfect results in nine feet, good results in fourteen feet, satisfactory result in one foot, and imperfect result in two feet.

A perfect result is one in which the patient walks squarely upon the sole of the foot and with flexion enough at the ankle-joint to make a perfect step.

A good result is one in which the patient steps squarely upon the foot, but is unable to flex the ankle sufficiently to bring the leg forward of a perpendicular to the floor without raising the heel.

A satisfactory result is one in which the *bared foot* shows that the outer edge of the sole bears the greater part of the weight, owing to a twist in the foot.

An imperfect result is one in which the correction of the equinus or varus has not been produced.

The operations may be classed under two heads:

(1) Those upon the soft parts.

(2) Those upon the bones.

Of the former we have four cases with six feet operated upon by tenotomies and fasciotomies alone with one perfect result, three good results, and two imperfect results. The imperfect results may be excluded from this division as being an imperfect application of the operation (Phelps's).

The bone operations we include under three heads:

(1) The extirpation of the astragalus, partial or complete, with or without the external malleolus.

Of these there are four cases with five feet; one of the head, neck and part of the body of the astragalus, really a wedge, with a perfect result; four cases (three patients) of complete extirpation of the astragalus alone, in which we have three perfect results and one good result.

(2) The cuneiform osteotomies, including parts of the astragalus, os calcis, cuboid, scaphoid and cuneiform bones, with or without tenotomies and fasciotomies, comprise twelve cases (seven patients) with two perfect results and ten good results.

(3) The extirpations of the astragalus and cuneiform osteotomies comprise four cases, in three patients, with four perfect results.

As to the treatment of congenital club-foot, there can be no doubt that the very best results are obtained by mechanical treatment during the first thirty months of life, during which time the growth of the foot is relatively the greatest. Mechanical treatment, combined with fasciotomies and tenotomies during this period, in the first and second degrees of deformity, give results which in after life show no imperfections in motion nor atrophy of the foot, as may at times be seen after operative interfer ence. The surgeon, however, does not come in contact with these cases. He only sees them when the skeletal deformity is marked, and the motions in the ankle and tarsus are limited, and he is to obtain the best result he can from a poorly-constructed and deformed foot.

Tenotomies and fasciotomies, combined with mechanical treat-

ment, are to be used in all cases of the second degree, where tendon and fascial contraction cause in great part the deformity, and where after these performances the unfolding of the foot is possible. As an adjunct to the bone operations, tenotomies and fasciotomies are of the greatest service. When, however, the unfolding of the foot puts the skin and deeper tissues on tension, some method of operation which will relieve this tension, when the foot is pronated, abducted and flexed, must be employed. The selection must be made of an operation in which, when the correction is secured, and the union of the tissues has taken place, no apparatus is necessary to hold it in position. Of these bone operations the extirpation of the astragalus would seem to be indicated where the chief deformity in the foot is due to the astragalus, and the flexion at the ankle-joint cannot be carried beyond a right angle with the foot, on account of the prominence of this bone anteriorly. The advantages of this method as contrasted with the removal of a wedge from the tarsus are that the arch of the foot remains intact, and the loss of the keystone of this arch (the astragalus) does not weaken it, since the softened bones, owing to the weight of the body in walking, take a nearly normal position. The growth of the foot is not interfered with in any essential degree. The supinated position of the calcaneus is corrected, and it gives in place of a very slightly movable ankle-joint, a syndesmosis, which is often more movable, and, provided the deformity has been corrected, gives no greater tendency to recurrence.

The excision of the astragalus alone is only to be selected (excluding the operation in the child in early life), when it removes completely the deformity by relieving the plantar flexion at the ankle, and by allowing the correction of the angular bend and torsion at Chopart's joint.

This necessarily provides that no great degree of nearthrosis exists between the calcaneus, the tibia and the fibula, producing plantar flexion, and that the deformity at the medio-tarsal joint is slight.

In the adult, where the difficulty in removing the astragalus is often considerable, the removal of a portion of the malleolus

externus facilitates the operation, and is not followed by any untoward results. In the child, however, such a removal is not admissible, for fear of the unequal growth and deformity which may result.

When the flexion at the ankle-joint can be brought to a right angle or more, and the distortion of the foot is principally in the medio-tarsal joint, cuneiform osteotomy is the slightest and easiest method of treatment. In the child the correction is often completed by the removal of a wedge, involving the adjoining parts of the cuboid and calcaneus, though it is *not often* necessary, and *only* admissible when mechanical treatment has failed. I have so far seen no interference in growth from such limited wedges. In the adult the bone removed is more quadrilateral than triangular in shape, and with its broad surface upon the dorsum and lateral border of the foot.

To correct this deformity the scaphoid, head of the astragalus, part of the calcaneus and cuboid bones are most frequently removed. Just so much is to be removed as will correct the torsion, angles and curves of the foot. The principal disadvantages of this method seem to be that the supination in the calcaneus remains, that the arch of the foot is broken, and that the growth of the foot is interfered with in the younger class of cases. Moreover, the synostosis which takes place at the line of resection, provided the motion at the metatarso-phalangeal articulation is not sufficient, will force the patient to walk largely upon the outer half of the foot.

The indications for this method are, if we exclude age: (*a*) Motion at the talo-crural articulation to a right angle or more with considerable ease; (*b*) no great lateral mobility at the ankle; (*c*) slight supination in the calcaneus and motion in the metatarso-phalangeal joints. While, on account of the synostosis at the line of resection, the motions of the foot cannot be compared with those of a normal foot, very favorable results are obtained, and where failures exist they seem to be due to an uncorrected supination of the calcaneus, excessive lateral motion at the ankle-joint and the want of motion in the metatarso-phalangeal joint. In the severest forms where the deformity consists in a nearthrosis

between the supinated calcaneus, the tibia and the fibula with a prominent astragalus and no flexion at the ankle-joint together with excessive distortion at Chopart's joint, the talus extirpation is combined with cuneiform osteotomy. It is, indeed, impossible without a talus extirpation to correct the plantar flexion at the ankle-joint and the supination of the calcaneus. Having corrected this, it is necessary to flex dorsally, pronate and abduct the forefoot, and to do this we must remove a sufficient wedge from the medio-tarsal-joint. Happily, these severe forms requiring, in addition to the extirpation of the astragalus, the cuneiform osteotomy are rarely found, except in adults. When these exist in children, such cuneiform resections should not be performed before two and a half years, at which time the children have begun to walk. Such an osteotomy never involves more than a part of the processes anterior of the calcaneus and a part of the cuboid bone. The result depends more upon the extirpation of the astragalus and the separation of the calcaneus from the fibula (ligamentum calcaneo-fibulare) than upon the removal of the wedge at the medio-tarsal joint, for unless the supination of the calcaneus is corrected, and dorsal flexion at the ankle-joint is produced, a cause for an early recurrence is left in the equinus and supination of the calcaneus. While an equinus remains the foot in the last act of stepping is always adducted and twisted upon its long axis, a motion or motions which easily result in the production of a varus, especially when the calcaneus remains supinated. To thoroughly correct this tendency, a dorsal flexion beyond a right angle is necessary, and to correct this the talus is sacrificed.

(*b*) Congenital Talipes Equino-Valgus.

Case I.—M. A., eleven years; January 24, 1890. Family history, negative. Previous personal history, healthy.

Present Condition.—Congenital talipes equino-valgus of the left foot; the inner margin of the astragalus rests upon the ground; the foot is in equino-valgus position and cannot be flexed to a right angle; it is of the third degree.

January 31. Tenotomy of the tendo Achillis; partial arthrodesis of the ankle-joint involving the inner half of the astragalus and artic-

ular surface of the tibia, in form of a wedge, and cuneiform osteotomy of the astragalus and scaphoid bones; plaster-of-Paris splints.

February 10. Wounds healed; position good; plaster-of-Paris splint.

February 18, February 27. Plaster-of-Paris splint.

March 14. Plaster-of-Paris splint; discharged with apparatus to prevent recurrence.

August, 1893. Report from the physician in attendance is that an apparatus was worn for six months; flexion exists at the ankle-joint to a right angle; the inner border of the foot shows no falling; the heel and toes are the points of pressure in the foot; no valgus is present; result is good.

Variety, and Degree, and Date.	Age.	Result.	When Seen or Heard From.	Method of Operation.
Talipes equino-valgus; third degree; single; January 24, 1890.	11 yrs.	Good.	August 10, 1893.	Tenotomy of tendo Achillis; arthrodesis of ankle-joint with removal of wedge from articular surface of astragalus and tibia, cuneiform osteotomy of part of astragalus and scaphoid bones.

The changes in the bones of the foot in all forms of valgus are slight, and seem both in the congenital and acquired variety to be largely influenced by the pronated position of the calcaneus, and the pressure upon the ligamentum calcaneo-naviculare by the talus.

The caput tali is always prominent, owing to the lateral displacement and rotation of the navicular bone. Its superior articular surface is flattened rather than rounded. The facets for the malleoli are placed anteriorly to their normal position. The more marked the valgus the more the navicular facet of the talus is displaced upward and outward, and the facet for the ligament (calcaneo-navicular) occupies the inner and lower portion of the head. In the severest types the ligament facet occupies the whole articular surface of the head, with the exception of a small portion of the upper and outer part.

The calcaneus suffers changes only upon its surfaces.

The navicular bone is often much altered in shape, so that

the bone is represented by a wedge, the base of which is directed towards the sole. It is also rotated upon an antero-posterior axis. The cuboid and semilunar bones are not altered, especially in shape, but show the same rotation.

The positions of the joints in congenital flat-foot are in the talo-tarsal joint, pronation as well as a sliding of the talus inward and forward upon the calcaneus; in the calcaneo-cuboid joint, a position of reflexion; in the talo-crural joint, a plantar flexion, which is looked upon as a compensatory movement. It is a direct result of the falling of the external arch. As a result the flat-foot becomes an abducted, pronated and reflexed foot, with adduction at Lisfranc's articulation in the severest cases. In the case we have at hand the operation was devised to remedy this deformity.

(1) To relieve the equinus by tenotomy of the tendo Achillis.

(2) To change the pronated position of the calcaneus and talus by removing a sufficient wedge from its superior surface, and producing ankylosis between it and the tibia.

(3) To produce a proper internal arch by removing a sufficient wedge, involving both the displaced head of the talus and the scaphoid.

This is essentially a combination of Ogston's and Burnet's operations, with this difference, that the ankle-joint is opened and ankylosis is obtained. Whether a better result would have been obtained had the wedge removed not involved the ankle-joint is a matter of experience.

(*c*) Acquired Club-Foot.

Paralytic Variety.—Of this variety we have nine cases of talipes equino-varus, and one case of talipes calcaneo-cavus.

Case I.—N. L., sixteen years; February 9, 1887. Family history, negative. Previous personal history, healthy; at five years infantile paralysis.

History of Present Condition.—At five years of age infantile paralysis, involving the right foot, and resulting in eight weeks in a

talipes equino-varus; apparatus was worn for four years; at present the equinus and varus are marked; the long axis of the foot is shortened, and the foot at the medio-tarsal joint is in plantar flexion and supination; the deformity is of the third degree.

February 10. Tenotomy of the tendo Achillis; excision of the head and neck of the astragalus and part of os calcis in form of wedge; dressing; plaster-of-Paris splint.

March 11. Dressing removed; healed; position good; plaster-of-Paris splint.

March 21. Plaster-of-Paris splint.

March 31 to April 9. About wards with apparatus.

April 9. Discharged. Result is good so far as position is concerned; wears apparatus to flex the foot upon leg.

August 9, 1893. Account from patient is that the brace was worn for one year; the foot is still in good position; there has been no tendency to recurrence; flexion at the ankle to a right angle with the leg is impossible unless produced by mechanical contrivances attached to shoe, though he walks well without an apparatus.

CASE II.—E. D., fourteen years; March 15, 1889. Family history, negative. Previous personal history, moderate anæmia.

History of Present Condition.—At two years she had convulsions, followed by hemiplegia. The deformity in the foot gradually increased, until three years ago, when it became necessary to wear an apparatus; there is still a partial paralysis of the left arm and leg; the left foot is a talipes equino-varus of the second degree, with much contraction in the plantar fascia.

March 20. Tenotomy of the tendo Achillis, and peroneus longus and brevis; fasciotomy of the plantar fascia; replacement easy; dressing, plaster splint.

April 7. Wounds healed; plaster-of-Paris splint.

April 16. Plaster-of-Paris splint.

April 19. Discharged; foot is in good position.

September 10, 1893. Account from patient is that the foot still remains in good position; no power over flexion at the ankle-joint, so that an apparatus is still worn in the shoe, producing permanent flexion. Result is satisfactory.

CASE III.—E. B., eleven years; January 5, 1890. Family history, negative. Previous personal history, strong and healthy. At two years of age infantile paralysis, involving lower extremities; has never walked until three years ago, when arthrodesis of right knee

was performed at the Roosevelt Hospital; it is still in good position and ankylosed; for the last three years she has been walking with crutches, and the deformity in the right foot has become apparent and increased.

History of Present Condition.—There is a marked talipes equino-varus of the right foot; the left foot is in the position of calcaneo-cavus; the right foot is in plantar flexion, adduction and well-marked supination; the astragalus is very prominent in front of the external malleolus; calcaneus is supinated slightly; greatest deformity seems to be in the medio-tarsal joint; the left foot shows great eversion when she rests upon it; the point of pressure is the inner and posterior border of the heel; the ankle-joint has a great deal of lateral motion.

January 9. Right foot: Cuneiform osteotomy involving prominent head and neck of the astragalus and part of os calcis; position is good; dressing, plaster-of-Paris splint.

February 2, February 21, March 16, March 30, April 21. Position is good; plaster-of-Paris splints.

May 10. Left foot: Fasciotomy and Karewski's operation, removal of a section, in form of a wedge, from tibia, fibula and astragalus, preserving the anatomical relation and shape of the bones to secure a firm ankylosis; dressing, plaster-of-Paris splints.

May 28. Plaster-of-Paris splints.

June 10. Healed; plaster-of-Paris splints; right foot has no dressing; position is good; left foot is completely healed; plaster splint.

July 24. Has been using both feet aided by apparatus to the foot and crutches for support; discharged. Patient was treated in the Out-patient Department for several months, during which time she gradually became more proficient in the use of the limbs, using, finally, one crutch and no apparatus to the feet.

September 16, 1893. Patient was seen on the above date. She uses a crutch or cane; requires no apparatus for the feet; she walks well as she has an ankylosis in both ankle-joints and the knee; the ankylosis in the right ankle-joint was probably due largely to the opening of this joint during the removal of the portion of the astragalus forming the wedge; it was a fortunate rather than an intended result; the ankylosis is not complete and some motion with stability in joint is present.

CASE IV.—J. H., twenty-five years; April 23, 1890. Family

history, negative. Previous personal history, usual diseases of childhood; at two years of age infantile paralysis involving the anterior tibial group of left leg; nine years ago tenotomy of the tendo Achillis, neglected the use of apparatus, deformity has recurred.

Present Condition.—Talipes equino-varus of third degree; the varus is not marked, slight supination and adduction of the fore-foot; supination in calcaneus is very slight; the astragalus is prominent anteriorly and interferes with flexion to a right angle.

April 24. Tenotomy of the tendo Achillis; reduction of the deformity incomplete in that the foot is only held in right-angle position to the leg with some force; the varus is only relieved by force, no further operative treatment; dressing, plaster-of-Paris splint.

May 2. Plaster-of-Paris splint; the position is good, but will require an apparatus to maintain position of flexion and pronation of the foot; wound is healed.

May 6. Discharged; treated in Out-patient Department with apparatus to relieve the tendency to equinus and supination.

August, 1893. The patient still wears an apparatus; it is necessary to continue this at the present as the equinus and varus increase when it is not in use; result from operation is imperfect.

CASE V.—J. T., thirteen years; May 27, 1890. Family history, tuberculosis. Previous personal history, malaria, rheumatism, otherwise healthy.

History of Present Condition.—At three years, infantile paralysis involving the anterior tibial group of right leg; one month after this attack a gradual eversion of the foot followed; two years ago equinus was added to the valgus. At present the position is one of marked equinus with very slight valgus.

May 29. Tenotomy of the tendo Achillis; reduction of the deformity requires some force; plaster-of-Paris splint applied with the foot strongly flexed and inverted.

June 12. Wound healed; foot in good position, though it requires force to retain it; plaster-of-Paris splint.

June 15. Plaster-of-Paris splint; discharged.

September, 1893. Patient has worn an apparatus since; no equinus nor valgus when using splint, without it there is still a tendency to both; result good when apparatus is worn.

CASE VI.—W. R., seventeen years; June 8, 1890. Family history, tuberculosis. Previous personal history, healthy.

History of Present Condition.—At five years of age, infantile paralysis of right leg, leaving his foot in the position of equino-varus of third degree; the equinus was extreme, the varus well marked, as he describes his deformity; he has worn a brace until six years ago, when he was operated upon; evidently a tenotomy of various tendons; he derived no benefit from this operation; at present the equinus is well marked; the dorsum of the foot is much arched; there is a considerable prominence of bone (astragalus) in front of the external malleolus; there is some supination of the foot in front of the medio-tarsal joint; the point of pressure in walking is upon the base of the foot; there is a well-marked cavus; the tibia is one inch shorter than that of the opposite extremity.

June 13. Fasciotomy of plantar fascia; tenotomy of the tendo Achillis; cuneiform osteotomy, involving head and neck of the astragalus, scaphoid, cuboid and base of fifth metatarsal bone; dressing, plaster-of-Paris splint; position is good.

June 14. Healed; plaster-of-Paris splint.

July 1 and 20. Plaster-of-Paris splint.

Discharged; patient returned to the hospital until September 1, at which time union was firm.

September, 1893. Patient was examined by me, and the result was good; flexion can be carried to beyond a right angle, but not voluntarily; there is no varus present; patient walks firmly and squarely upon the sole of the foot; there has been no tendency to a recurrence of the equinus.

CASE VII.—W. W., three and a half years; November 30, 1891. Family history, negative. Previous personal history, healthy. Parents have noticed during the last year that the foot has gradually become deformed; no history of a distinct attack of infantile paralysis involving the leg; the loss of power has been gradual.

Present Condition.—The left foot is in the position of a marked talipes equino-varus; it is of the third degree; heel raised; supination and adduction of fore-foot; calcaneus slightly supinated.

December 5. Tenotomy; cuneiform osteotomy, including the head of astragalus, part of os calcis and part of cuboid bones; reduction easy; dressing, plaster-of-Paris splint.

December 27. Healed; position is good; plaster splint.

January 24. Plaster splint.

February 13. Allowed up with plaster splint.

February 27. Splint removed; union firm; patient walks well with slight power for flexion.

September, 1893. Patient has continued to walk without an apparatus; no deformity has recurred; has still some power for flexion; cannot flex voluntarily to a right angle with the leg, though this is easily done by pressure in walking. Result good.

CASE VIII.—H. W., thirteen; July 9, 1892. Family history, negative. Previous personal history, healthy. Eleven years ago infantile paralysis involving the left leg; the muscles recovered their power except anterior tibial group.

Present Condition.—Marked talipes equino-varus; the toes are in dorsal flexion; the deformity seems dependent upon the astragalus more than upon the other bones; it is of the third degree; there is considerable atrophy of the muscles of the leg.

July 16. Fasciotomy; partial extirpation of the astragalus in form of wedge; dressing, plaster-of-Paris splint.

August 4. Allowed on crutches; plaster-of-Paris splint.

August 13. Wound healed; plaster-of-Paris splint.

August 31. Plaster-of-Paris splint.

September 14. Ankylosis not firm; plaster-of-Paris splint; discharged with foot in good position.

September, 1893. Patient was heard from by letter; walks with the foot squarely upon the ground; ankylosis at ankle-joint firm; has never used an apparatus; result is good.

CASE IX.—C. W., seven years; August 24, 1892. Family history, negative.

History of Present Condition.—At the age of two years infantile paralysis involving both legs; recovery followed except in anterior tibials and peroneals of the right leg; he has a well-marked talipes equino-varus of the third degree.

August 30. Tenotomy of tendo Achillis; fasciotomy; cuneiform osteotomy of head of astragalus and os calcis in part; dressing, plaster-of-Paris splint; position is good.

September 3. Plaster-of-Paris splint.

September 21. Plaster-of-Paris splint; healed.

October 9. Plaster-of-Paris splint; good firm union.

October 13. Plaster-of-Paris splint; discharged.

September, 1893. Walks squarely upon foot; no equinus nor varus; foot can be flexed to right angle with the leg; has some power in this movement of flexion, though not quite to a right angle; the ankle-joint has some though slight lateral motion; result is good.

Table of Cases of Acquired Club-Foot. Talipes Paralytica.

1. Talipes equino-varus; third degree; February 9, 1887.	16 yrs.	Good.	August, 1893.	Tenotomy of tendo Achillis; cuneiform osteotomy of head and neck of astragalus, and part of os calcis.
2. Talipes equino-varus; second degree; March 15, 1889.	14 yrs.	Satisfac-tory.	September, 1893.	Tenotomy of the tendo Achillis; peroneus longus and brevis; fasciot-omy.
3. Talipes equino-varus; third degree; and talipes calcaneo-cavus.	11 yrs.	Good.	September, 1893.	(1) Cuneiform osteotomy, in-volving head and neck of astrag-alus, and part of os calcis; (2) fasciotomy and cuneiform osteot-omy, involving ankle-joint.
4. Talipes equino-varus; third degree; April 24, 1890.	25 yrs.	Imper-fect.	August, 1893.	Tenotomy of tendo Achillis.
5. Talipes equino-varus; third degree; May 27, 1890.	13 yrs.	Satisfac-tory.	September, 1893.	Tenotomy of tendo Achillis.
6. Talipes equino-varus; third degree; June 8, 1890.	17 yrs.	Good.	September, 1893.	Fasciotomy; tenotomy of tendo Achillis; cuneiform osteotomy of head and neck of astragalus, sca-phoid, cuboid, and (5) metatarsal bone.
7. Talipes equino-varus; third degree; November 30, 1891.	3½ yrs.	Good.	September, 1893.	Tenotomy of tendo Achillis; cuneiform osteotomy of head of astragalus, part of calcaneus, and part of cuboid.
8. Talipes equino-varus; third degree; July 9, 1892.	13 yrs.	Good.	September, 1893.	Fasciotomy; partial extirpation of the astragalus in form of wedge.
9. Talipes equino-varus; third degree; August 24, 1892.	7 yrs.	Good.	September, 1893.	Fasciotomy; tenotomy of tendo Achillis; cuneiform osteotomy of the head of the astragalus, and part of the os calcis.

This table represents nine cases of paralytic talipes equino-varus of the second and third degrees, with nine feet operated upon, in which the results are good in six feet, satisfactory in two feet, and imperfect in one foot.

I claim as a good result such a foot as presents no deformity in the tarsus nor ankle-joint, and one in which the muscular power after the operation is sufficient to flex the foot to at least a right angle with the leg, or in which on account of the previous complete loss of power in the leg arthrodesis at the ankle-joint has placed the foot in a good position for use at right angle with the leg.

A satisfactory result is one in which the deformity is completely relieved, but an apparatus must be permanently worn to

flex the ankle-joint. An imperfect result is one in which the deformity is not completely relieved, and an apparatus is necessary to maintain the foot in good position.

The tenotomies and fasciotomies comprise three cases, one of the second degree, with a satisfactory result, two of the third degree, with one imperfect result, and one satisfactory result.

There are six cases in which tenotomy, fasciotomy, and a bone operation were done ; one of these was a partial cuneiform extirpation of the astragalus with a good result, as the shortening of foot was easily corrected by a thick sole. Five of them were cases in which, besides tenotomies and fasciotomies, cuneiform osteotomy was performed, involving the head of the astragalus, part of os calcis, etc., with five good results.

There remains one case of talipes calcaneo-cavus, in which fasciotomy and cuneiform osteotomy, involving the astragalus and tibia and fibula by means of Karewski's incision, was performed with the idea of producing a complete ankylosis at the ankle, and the relief of the cavus, since the muscular power was completely lost. The result in this case was good.

In the paralytic variety much will depend upon the degree of paralysis in the leg. Where some power remains tenotomy and fasciotomy may be sufficient, or if the deformity exists in the medio-tarsal joint, combined with cuneiform osteotomy. If such power in the muscles is wanting it may be a question whether we do an operation which will permanently fix the ankle-joint in the most useful position, or leave the ankle-joint movable, and rely upon an apparatus which flexes the foot, but allows the extensors of the leg to act.

For my part, I prefer the foot which is permanently fixed at the ankle to one which is movable and requires an apparatus to maintain the position of flexion, against which the extensors are to act in every step. It is just in this variety that arthrodesis, *i.e.*, ankylosis and fixation, together with correction of the deformity, seems to have its field for application.

In cases where the deformity is principally in the ankle-joint, Lauenstein's or Rydygier's incision and the extirpation of a wedge, including for the most part the talus and to a less

extent the tibia with correction and fixation, seems to be the most feasible method. Where the deformity exists, both in the medio-tarsal and ankle-joints, arthrodesis of the ankle-joint and cuneiform osteotomy at the medio-tarsal joint are indicated.

In very old cases with great loss of power in the muscles and shortened limbs a cuneiform osteotomy, including the head and neck of the astragalus and part of the calcaneus, so fashioned as to leave the foot in partial extension to accommodate for the shortened limb, gives very good results.

Cases which will not allow of correction at all must be subjected to amputation.

In conclusion, I wish to state that I do not believe in any routine operative treatment for club-foot. Each case is to be studied for itself with the idea of restoring the function and relieving the deformity.

In the first and second degrees, when the treatment is begun shortly after birth, traction, stretching, massage and proper fixation generally suffice. When these are found to be insufficient, tenotomy of the tendo Achillis, tibialis posticus, or Phelps's operation, with or without fasciotomy, to correct the resistance in the soft parts and to bring the foot into position or, if the foot be one of the paralytic variety, arthrodesis of the ankle-joint may be indicated.

In the third degree of deformity, which includes what are spoken of as complicated or inveterate (and resistant) cases, operative treatment is, I think, always indicated. The former class of cases includes that variety in which, though the varus is reducible, the equinus cannot be corrected owing to the prominent irregular mass of bone which fills what should be a normal depression in front of the fibula. Cases with such a pathological condition admit of but one plan of treatment,—*i.e.*, the removal of a portion or the whole of the astragalus.

In the congenital club-foot of this variety, a complete extirpation is recommended. In the acquired variety of paralytic origin a cuneiform osteotomy, including this prominent angle of the astragalus and adjoining surface of tibia, is indicated as it fulfils the indication to correct the deformity and to produce a syndesmosis between the astragalus and tibia.

The inveterate cases are those in which the tarsus is misshapen, supination and adduction are present to a marked degree. The patient walks upon the cuboid and os calcis, or on the dorsum of the foot with practically no movement in the ankle-joint. Where tarsectomy is alone performed in this variety, it must be perfectly evident that the deformity exists principally in the medio-tarsal joint, and that the movement of flexion in the ankle-joint is possible to a right ankle. If, however, this movement of flexion is not possible or is restricted by the astragalus, and the supination of the calcaneus is marked, the extirpation of the astragalus and the division of the calcaneo-fibular ligament is necessary in addition to the cuneiform osteotomy of the tarsus. There are many grades of deformity in this variety, so that one is compelled to vary the extent of these two methods constantly. As factors in the production of the equinus and varus, the astragalus and calcaneus are to be studied in every case, since permanent results after partial correction of the deformity are largely dependent upon them. Unless the equinus is completely removed and the supination in the calcaneus is corrected, every step made by the patient aids a return of his varus.

It is imperative, if we wish to obtain a permanent and good result, to relieve all deformity completely and at once. This ought to be accomplished before the weight of the body is allowed to act upon the foot. It should not be our aim to obtain beautiful cosmetic results, for they are easily obtained and generally require the use of apparatus and support to avoid recurrence.

The clearest evidence of an imperfect operation is the need of an apparatus and support after correction has been accomplished.

A perfect operation implies a six to ten weeks in plaster-of-Paris splints and an ordinary laced shoe with an elevated sole in particular cases. In the case of equino-valgus and in that of calcaneo-varus, which have been here reported, I can only say that the results were gratifying. They are comparatively rare forms and the operative procedures were based upon the experience of others more versed in this variety.

This record includes the cases operated upon at the Roosevelt Hospital from 1886–1893.

TRAUMATIC SEPARATION OF THE EPIPHYSES OF THE LOWER EXTREMITY.

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THE subject of separation of the epiphyses is one of considerable interest and no little importance when we consider the comparative frequency and possible results, especially shortening of the limb with resulting lameness in the lower extremity.

In the Guy's Hospital Reports of 1889 I have dealt with separations in the upper extremity, and now present a collection of similar cases in the lower limb.

Separations at the Upper End of the Femur.

The upper epiphysis of the femur is developed from three distinct centres: for the head, the greater trochanter and the lesser trochanter. These are united in the reverse order of the appearance of their ossific nuclei, so that the lesser trochanter is united to the shaft about the seventeenth year, the greater trochanter about the eighteenth, and the head from the eighteenth to the nineteenth year. The neck of the femur is formed by an extension of ossification from the shaft.

Under our notice separations of the head and greater trochanter will pass, but of separation of the epiphysis of the lesser trochanter I am unable to find any case; indeed, except by muscular action, I think it very unlikely to occur on account of its very deep and well-protected situation and its short life-history as a bony nucleus, merely extending from the thirteenth to the seventeenth year.

CASE I.—A. W. MAYO ROBSON.[1] W. C., aged five years, was seen on account of lameness in the left lower extremity. Four years previously she was thrown up in the air by her uncle, who failed to catch her, letting her fall heavily on the left side. No treatment but rest. Symptoms: Marked limp on walking, leaning to the left; well-marked eversion of the foot, which could, however, be brought parallel to the right without giving pain; ability to completely flex and extend the thigh; left limb three-fourths of an inch shortening, and greater trochanter was raised three-fourths of an inch above Nélaton's line; and Bryant's line was three-fourths of an inch shorter on the injured side; the folds of the buttocks were well marked; on flexing and rotating inward of the left femur the fingers could clearly feel the neck as far as the head, but the caput femoris was apparently in the acetabulum, and *not* attached to the cervix.

Remarks.—"The case related is either a fracture through the neck of the femur or a separation of its upper epiphysis. I believe it to be the latter, and in this opinion I am supported by my colleagues."

CASE II.[2]—Boy, aged ten, fell out of first-floor window; foot everted and scarcely any shortening; movements of thigh free and nearly painless; flexion of the knee and rotation outward gave a very distinct sensation of dummy crepitus within the hip-joint as if one articular surface had slipped off another; and this led me to suppose that separation of the epiphysis of the caput femoris had occurred with the capsule. This opinion was confirmed by Green.

Treatment.—Double inclined plane; result good.

CASE III.—*Supposed Separation.*—F. N. HAMILTON.[3] A. W., aged fifteen, fell from the fourth story of a house; next day I found the right thigh shortened three-fourths of an inch and slightly abducted; toes everted; under chloroform, dull crepitus in the joint, unlike that of broken bone.

Treatment.—Extension; fifteen pounds kept it in position, but two weeks afterwards the limb was found to be shortened half an inch, so four more pounds were then added. "I believe it to have been a separation of the upper epiphysis."

CASE IV.—*Supposed Separation.*—PACKARD.[4] A young adult,

[1] Lancet, Vol. II, 1886, p. 343.
[2] South's Chelius, Vol. I, p. 565.
[3] Fractures and Dislocations, p. 374.
[4] Inter. Encyc. of Surgery, Vol. IV, p. 198.

aged nineteen, fell from a high wagon-seat and sustained what appeared to be a fracture of the neck of the femur. He was treated by weight extension and a plaster-of-Paris spica, and in six weeks was walking about.

Remarks.—"I believe the lesion was really a separation of the epiphysis."

CASE V.—*Post's Case.*—HAMILTON.[1] A girl, sixteen years old, made a false step with a child in her arms, and, feeling something give way, was obliged to lean against a wall. Next day the affected limb was found to be one inch short, movable, toes turned outward, no swelling, some slight pain at the upper part of the thigh; the trochanter major moved with the shaft; there was also crepitus. "From the age of the patient and the slight amount of violence, Post thought a separation of the epiphysis had occurred."

Treatment.—Extension. Result, half an inch shortening.

CASE VI.—JONATHAN HUTCHINSON.[2] Mr. Hutchinson was sent for, one night, to the London Hospital to see a patient with supposed dislocation of the hip. The house-surgeon believed he had reduced it more than once, but it had slipped again.

Boy, aged eighteen, was knocked violently backward by an explosion of gunpowder. Symptoms: Left limb slightly everted and shortened one inch; the great trochanter moved with the shaft; the limb could be drawn down, but it slipped up again as soon as traction was remitted. No true bony crepitus was elicited, but a rough grating sensation could be felt.

Treatment.—Long outside splint and perineal band. Result: Perfect, with good bony union. In Mr. Hutchinson's opinion the diagnosis lay between extra-capsular fracture and separation of epiphysis.

CASE VII.—*Autopsy.*[3]—Patient, fifteen years old, was run over by a wagon. Symptoms: Shortening, eversion, and inability to move the limb. The patient died in a few hours.

Post-mortem.—The separation was complete along the epiphyseal line, and the head was attached to the neck by a strip of periosteum only two inches wide; the capsule was torn at its inner portion.

CASE VIII.—BARTON.[4] John L., aged fifteen, fell lightly to the

[1] Fractures and Dislocations, p. 374.

[2] Med. Times and Gaz., 1866, Vol. I, p. 195.

[3] Les Bulletins de la Société Anatomique, 1867, p. 283.

[4] Med. News, 1886, Vol. II, p. 43.

ground supporting his weight by his hands. The hip can scarcely have touched the ground. Symptoms: Shortening one inch; eversion of foot, trochanter above Nélaton's line. Under ether, the limb rotated as readily as its fellow, but the trochanter described a circle of less radius than normal. On extension, crepitus of an unusual kind was felt.

Remarks.—After excluding dislocation, Barton diagnosed separation of the epiphysis. Results: One year later shortening one and a half inches, but good movement of the limb.

CASE IX.—MAUNDER.[1] Boy, aged fourteen, received a blow on the front of his thigh and fell upon his hip. He walked home, some hundred yards, leaning on the shoulder of a comrade. Symptoms: limb rotated outward, shortened one-half to three-quarters of an inch; much pain. Examination under chloroform, the limb could be drawn down to its normal length and a soft crepitus was felt about the head of the bone. Mr. Hutchinson was invited to see the case, and both he and Mr. Maunder concluded that it was one of separation of the epiphysis.

Specimens.—The London Hospital Museum contains "the pelvis of a rabbit with both femora, showing separation of the epiphysis of the head of both femora. The contiguous surface of the epiphysis and shaft have been partly smoothed by friction. The specimen was from a doe-rabbit, which had never thriven well. The separation of the epiphysis was attributed to the amorous violence of a buck-rabbit."[2]

Remarks.—From the fatal case No. 7, it will be gathered that the disjunction occurs within the capsule, and, therefore, its symptoms closely resemble those of a non-impacted intra-capsular fracture of the neck.

It is a rare injury. Holmes says:[3] "Its disjunction is unknown except in the fœtus, and in children we find dislocation of the hip occurring rather than separation of the epiphysis." Hamilton states that he has either met with or found reported four cases. The total number of cases, veritable and reputed, I have been able to collect is fourteen, from all sources. Of these I have selected nine as being more or less to the point.

[1] Lancet, 1870, Vol. 1, p. 192.
[2] London Hosp. Mus. Catalogue.
[3] Surgical Diseases of Childhood, p. 258.

Let me briefly analyze these nine instances. Of these, only one, No. VII, was verified by autopsy. In the other cases there was strong clinical evidence of the existence of the lesion in question. Thus, Case I was regarded by Robson either as an intra-capsular fracture of the neck of the femur or a diastasis. He inclined to the latter, and his opinion received the support of his colleagues. South's case, No. II, is admitted by subsequent writers and authorities to have been a genuine case. Hamilton's, Case III, is probably veracious, the dull crepitus being the central fact. Post's, Case V, was either an intra-capsular fracture or diastasis; but, considering the rarity of the former occurrence in young life, in all these doubtful cases where the diagnosis lies between the two conditions, the presumption is in favor of separation, if the patient is under nineteen. Barton's, Case VIII: here the diagnosis lay between rupture of the Y-ligament, absorption of the head of the femur from coxitis or diastasis; but he finally decided, and rightly, I think, in favor of the latter. Mr. Maunder's, Case IX, appears to be genuine, as both he and Mr. Hutchinson concurred in the diagnosis when the patient was examined under chloroform. It is much to be regretted that in Case VII, the only one in which an autopsy occurred, no other symptoms are recorded except shortening, eversion, and inability to move the limb: an opportunity such as this of clearing up doubtful points rarely presents itself.

It is very noticeable that, whereas intra-capsular fracture usually results from slight violence, separation follows great violence; thus, falls from the fourth story, from a first-floor window, from a high wagon-seat, and a knock-down blow in an explosion of gunpowder are quoted as causes. In one other instance a boy had been run over by a wagon.

It is worthy of remark that the average age of nine sufferers was somewhat over fourteen; that is, the separation occurs when the head of the femur no longer consists mainly of cartilage, but is nearly all bone, and therefore incapable to a large extent of accommodating itself to sudden shocks. The thin epiphyseal line is the weakest part of the neck, and therefore indirect violence spends itself chiefly at that point.

Before entering on the symptoms and diagnosis, I wish to allude to an anatomical point. Amesbury[1] says that the synovial membrane immediately investing the neck of the femur is often raised into longitudinal folds by strong ligamentous bands. Once Packard found a vessel of some size running along one of these folds. Fragments may be kept together by these bands.

Symptoms.—Pain may be severe or slight.

Crepitus of a peculiar dummy variety, or cartilaginous, or rough grating is felt.

Shortening in Case II equal to one-eighth of an inch, in Case III, three-fourths of an inch, in Case V, one inch, in Case VI, one inch, in Case IX, three-fourths of an inch; average, three-fourths of an inch.

Eversion occurred slightly in two cases, and more marked in two others.

Active Movements.—Their presence or absence will depend upon whether the ligamentous bands already spoken of are left intact. They may actually be so at the time of injury; but the patient finding that, though severely hurt, he is yet able to walk, in his attempt breaks them down. This occurred, perhaps, in Cases V and IX.

Passive Movements.—These are generally free.

Recurrence of Deformity occurs when extension is remitted. Other symptoms are the elevation of the trochanter above Nélaton's line, and the swelling and ecchymosis.

Diagnosis.—From intra-capsular fracture separation of the epiphysis is really a solution of continuity *within* the capsule, but, unlike fracture, is incapable of impaction. It seems to me that excepting in two points the diagnosis is in the highest degree obscure. The points are (*a*) the age at which fracture occurs. Hyde's tables[2] present but two cases of intra-capsular fracture under fifty. (*b*) Bearing in mind that there is under the twentieth year a weak spot in the neck at the epiphyseal line, it is more reasonable to expect that this has given way, rather than the stronger tissue on either side.

[1] Todd's Encyclopædia of Anatomy.

[2] Medical Record, 1873.

From extra-capsular fracture, both here and in diastasis, bruising is great, and the soft parts injured; they occur in young life; there is shortening and eversion. But in no instance of separation of epiphysis is there any mention of fissuring of the trochanter major,—a common occurrence in extra-capsular fracture. If no impaction occur, true bony crepitus is felt, and this is widely different from the "dummy" crepitus of diastasis. In fracture shortening is greater, two inches or more, while in separation it its hree-fourths of an inch on the average. In Hyde's tables of extra-capsular fracture ten were under fifty, and seven at or over fifty; the three youngest were respectively thirty, twenty-five, and twenty; all above the average age of diastasis, fifteen.

From fracture of the rim of the acetabulum: In both crepitus will be present; in both the deformity reappears after reduction. But in fracture of the acetabulum, owing to the upper and posterior part of the cup being broken, a dorsal dislocation of the head of the femur occurs, and the head can be felt in an abnormal position. This is not the case in separation of the epiphysis. From dislocation of the hip: Unless great bruising and swelling occur, the fixity of the limb, and the permanency of the reduction in dislocation, should be sufficient to clear up the diagnosis.

Mr. Hutchinson,[1] in a clinical lecture on the diagnosis of injuries about the hip-joint, laid down certain general rules for guidance in obscure cases. These were briefly: "(1) Always use chloroform or ether in difficult cases. (2) Do not be misled by the patient's statement, as to what he can accomplish with the injured limb, into the belief that he has sustained no serious injury; for instance, patients with dislocation are often able to lift the limb from the bed, and sometimes to walk. This occurs, too, in impacted extra-capsular fracture, in intra-capsular fracture, when the tissues covering the neck of the femur are not torn through, and probably in cases of separation. (3) In dislocation range of movement is decreased, in fracture it is increased. There may, however, be diminished movement in fracture due either to rigidity or to impaction. (4) Take into consideration the age of the patient and the nature of the injury. (5) Ever-

[1] Medical Times and Gazette, 1866, Vol. I, p. 194.

sion is the rule in fracture and separation of the epiphysis; but inversion sometimes occurs in fracture, and then there is some resemblance to dorsal dislocation."

Complications.—In Case VII, which was fatal, it is noted that the periosteum was stripped up on the lower and inner part of the neck, and the capsule was torn at its inner portion. There is no record of the separation being compound (*a priori*, a very unlikely occurrence), or of the injury being complicated by wound of vessels or nerves.

Effects.—(*a*) As to bony union, Hamilton writes, "bony union after epiphyseal fracture of the neck of the femur is a supposition which, as far as I can learn, no surgeon has yet ventured to make." Hutchinson, however, notes that in Case VI, "the union was quite firm." It occurs to one, however, that a fallacy may creep in. If there be sufficient inflammation to ankylose the head of the femur firmly, strong fibrous union will result in a false joint. (*b*) As to growth and length of the limb, shortening varied from six weeks to four years afterwards to the extent of one-fourth to one and a half inches. (*c*) As to movement,—generally good. (*d*) It is remarkable that while we are compelled to notice in diastasis elsewhere inflammation, followed by suppuration and necrosis, either of the shaft or the epiphysis (separation of the great trochanter), we find no record of suppuration or necrosis following separation, or what is believed to be such, of the epiphysis of the caput femoris. One would, knowing how often in coxitis the head of the femur is found separated and forming a marble-like sequestrum, have expected this result to have followed above all others in traumatic lesions. Since we have a large mass of bone, but feebly supplied with blood-vessels, suddenly deprived of the main bulk of its nutrition; and yet apparently it does not die. What explanation can be given? I venture to think that under the nomenclature of acute coxitis, acute suppuration, and disorganization of the hip, some cases of separated epiphysis have crept in; and the sequestrum has been looked upon rather as the result of joint inflammation than as the cause.

Treatment.—In South's case it was put up on a double

inclined plane. Most of the other cases were treated by extension either by weight and pulley or by the long outside splint and perineal band. Mr. Bryant's double splint is doubtless an excellent apparatus for fractures and similar lesions in the neighborhood of the hip in children, securing as it does due extension and immobility, at the same time rendering it easy to move the patient without displacing the fragments. Shortening here is not so important as at first appears, since growth of the femur in length is mainly dependent upon the integrity of the lower epiphysis. In the young, however, we must be on the watch for signs of lateral curvature of the spine secondary to any obliquity of the pelvis. In a child extension should be kept up for at least four weeks; but in patients beyond puberty from five to six weeks. Cautious movements should be made at first in allowing flexion at the hip; and if unproductive of pain or irritation, more and more freedom may be accorded to the patient, until he can move the limb without hindrance, after which with equal caution he may be encouraged to put the foot to the ground and bear his weight upon it.

Separation of the Epiphysis of the Great Trochanter.

Case I.—Aston Key. A young girl, aged sixteen, in crossing the street tripped, and in falling struck the trochanter against the curbstone. She immediately rose and, without much pain or difficulty, walked home; but feeling an increase of pain was admitted five days afterwards into Guy's. The right leg was considerably *everted* and appeared to be one-half inch longer than the sound one. It admitted of passive movement in all directions, but abduction gave her considerable pain. She had perfect command over all the muscles except the internal rotators. No crepitus or displacement of bone could be detected on the closest examination.

Nine days afterwards she died. Post-mortem examination revealed a fracture which had detached the trochanter, but without tearing through the tendons attached to the outer side of the process. This so effectually prevented all motion of the fractured part that the injury could not have been detected during the life of the patient.[1]

[1] Museum specimen, Guy's Hospital, No. 1106.

CASE II.[1]—In Agnew's collection is a well-marked example accompanied by a fracture of the condyles of the femur.

CASE III.—J. MCCARTHY.[2] A girl, aged eight, was brought to the London Hospital with a large swelling over the sacrum. The house-surgeon on duty considered the child too ill for examination, and death ensued within a few hours after admission.

Post-mortem Examination.—The left foot was everted; there was an abscess in the right sterno-clavicular articulation, pyæmic pericarditis, pleurisy and pneumonia, also a large collection of pus in the pelvis, which was connected along the tendon of the pyriformis with another abscess round the neck of the femur.

The trochanteric epiphysis was completely detached from the shaft, but was held in position by tendinous attachments and reflexions of the capsule. The history of the case was that the child, while playing about the room, had fallen on her left side about a week before being brought to the hospital; that nothing more had been noticed till on the Saturday night following, the older sister, while washing the child, observed a lump over the left hip; that the child was kept in bed in consequence; but two or three days later seemed to have some difficulty in breathing, and so was sent to the hospital; that even then the child walked holding by her mother's hand for about half a mile and did not complain of any pain; and that until she fell she had never had any illness.

Points of elucidation required in the case: (1) Did the abscess around the neck of the femur and within the pelvis extend to the site of detachment of the epiphysis? (2) Were the separated epiphyseal surfaces normal, and was the cartilage inflamed or was it lost?[3]

CASE IV.—MR. POLAND.[4] Occurred in a boy, aged twelve, from a direct blow, and was characterized by a projection and thickening of the great trochanter.

CASE V.—I. H. ASHTON. A boy, sixteen years old, was swung round by his friend, being held by the arm and leg, and then allowed to fall to the ground. He was able to work for some days, then followed pain and stiffness in the hip-joint and, finally, swelling of the whole femur, but no crepitation could be felt. An abscess formed over the trochanter with high fever and was opened. The patient

[1] Agnew's Surgery, Vol. I, p. 945.
[2] Path. Soc. Trans., Vol. XXV, p. 200.
[3] London Hosp. Mus., No. 424.
[4] Bryant's Surgery, 4th Ed., Vol. II, p. 447.

died fourteen days afterwards. At the post-mortem examination, the trochanter was found entirely separated from the shaft, and the hip-joint disorganized. The neck of the femur was necrosed.

Remarks.—This injury is by no means uncommon as a complication of extra-capsular fracture, but the separation of the epiphysis *alone* is a rare accident. Three cases were verified by autopsy. Of specimens extant there are: Agnew's, in his own collection; Warren's, a doubtful one from the dissecting room, Trinity College, Dublin, and he states that there are three others in the same Museum; Aston Key's, in the Guy's Museum; and McCarthy's, in the London Hospital Museum, while the whereabouts of Ashton's specimen is not stated.

As to the cause, it seems to have been due in all the cases above mentioned to direct violence, and this fact coincides with Packard's[1] opinion, who says that the cause would seem to be always direct violence.

Symptoms.—As far as the verified cases assist us, they are as follows:

(1) History of injury in some cases slight, in others severe. But I see no reason to doubt that muscular action may be a cause, considering the number, size, and power of the muscles attached to this epiphysis.

(2 Age, under seventeen.

(3) Pain, aggravated on pressure of the part, and slight swelling.

(4) If the trochanter is broken away completely from the shaft it is drawn upward, inward, and backward, by the action of the attached muscular fibres, and in such a case will be transferred from its normal place to that occupied by the head of the femur in dorsal dislocation. There may or may not be eversion of the foot. But judging from the above cases, it will as often happen that, although the epiphyseal line exhibits a distinct fissure, the trochanter is not drawn away from the shaft, owing to extensions of the capsule of the hip-joint, and to the numerous tendons attached to and passing over the trochanter.

[1] Internat. Encyc. Surg., Vol. IV, p. 199.

(5) If the fragments be widely separated crepitus can only be obtained on drawing the upper one down. If, however, they be close together a "dummy" crepitus may be felt.

(6) Movements after injury. Sometimes the limb is not immediately disabled, but the patient is able to walk about even to the extent of half a mile. Should, however, the fragments be widely separated there will be total disablement of the limb.

Diagnosis.—(1) From extra-capsular fracture of the neck of the femur. It should be remembered that separation or fissure of the great trochanter often co-exists with this; but if not, the following signs of fractured neck are missing in separation of the epiphysis: (*a*) there is no shortening of the limb; (*b*) in rotating the limb the trochanter does not describe a smaller arc than normal, but will either fail to follow the movements of the thigh, or, if the fibrous covering be untorn, will describe a normal arc.

(2) From dislocation of the hip on to the dorsum ilii, this doubt can only arise when the separated fragment is pulled upward and backward. Stanley, speaking of the danger of comparison between these two lesions, "urges the positive resemblance of the fractured portion of the trochanter to the head of the femur, the former occupying the same place as the latter on dislocation. And if with these circumstances there should happen to be an inversion of the injured limb the difficulty of the diagnosis is much increased." But I think a brief examination under chloroform would readily clear up all doubts.

(3) From simple contusion or bruise. In this case it is better to err on the safe side, and remembering what severe results occur from contusions of this part, to urge the patient to remain in bed at least for a few days, until the surgeon has satisfied himself that there is no gross injury to the bone. The results in Cases I and III might not probably have been so severe had the patients rested for some days after the injury. By that time, owing to disappearance of the swelling, any undue mobility about the trochanter could have been felt.

Results.—In Cases III and V large abscesses followed with

pyæmia and death. In the first case the trochanter was bare, separated from the shaft, but still retaining some of its tendinous attachments. In the second case it is stated that the trochanter was found entirely separated from the shaft, and the hip-joint disorganized. We may ask, Why do such fatal results occur in several of the recorded cases of disjunction of this epiphysis, whereas diastasis of the lower end of the humerus and femur (apparently a much greater injury) yields so small a percentage of sequent pyæmia? I think the explanation may be found in two facts. In the first place, the separated portion is a distinct process, and derives its main nutriment from the shaft. In the second place, the tendons attached and the prolongations of the capsule invest it with a continuous more or less avascular membrane, which does not take upon itself the usual *rôle* of blood supply, which falls to the periosteum. Under these circumstances, then, with the irritation of walking following on severe injury, a piece of bone so feebly nourished as the trochanter rapidly necroses with sharp formation of pus.

Treatment.—If the trochanteric epiphysis be entirely separated an attempt should be made to replace it and fix it. Sir Astley Cooper's[1] belt and pad might be used with great advantage, or the object might be well accompanied by means of a compress and strapping. Malgaigne suggested abducting and everting the limb, so as to lessen the distance between the shaft and the fragment. Packard surmises that some contrivance similar to Malgaigne's hooks would be useful. But personally I should be very loath to employ any such contrivance, bearing in mind the possibility of suppuration and pyæmia. It is possible, however, that Thomas's hip-splint would serve all the purposes of treatment.

Separation of the Lower Epiphysis of the Femur.

Case I.—Maunder.[2] A lad, aged twenty, slipped on to his back with a knee bent under him. On examination the limb had the position of genu-valgum; he could flex the thigh slightly on the

[1] Fractures and Dislocations, p. 180.

[2] Lancet, 1870, Vol. I, p. 192.

pelvis; and then the knee-joint appeared higher up the thigh than usual; the condyles of the femur, head of tibia, and patella had their normal relations, and the loss of continuity corresponded to the junction of the condyles with the shaft of the femur; a *soft* crepitus was readily elicited.

CASE II.—CLEMENT DUKE.[1] Mr. X., aged eighteen, whilst playing, was pushed on the outer side of the right leg, the limbs being extended and abducted. He suddenly felt acute pain, and fell down with the leg powerless. On examination knee-joint not swollen, no distortion perceptible to the eye, foot not twisted nor everted, limb slightly shortened on measurement; on partial flexion of the leg a movement was felt like two smooth surfaces rubbing over one another; the situation of this rub corresponded to a slight depression two inches above the knee; posteriorly the upper end of the lower fragment could be felt in the popliteal space; the diagnosis of separation of the epiphysis was made.

Treatment.—Long outside splint with perineal band and small, straight, back splint, with a pad sewn on it to keep the lower fragment from slipping out of place. Result: firm union at the end of six weeks; no shortening and no thickening at the site of fracture.

CASE III.—HILTON.[2] John H., aged eighteen, while carrying a hod of bricks down the slope of a railway embankment, slipped and fell with his legs doubled under him. During the fall he felt a most severe pain in the left knee, and was quite unable to straighten the limb. On examination the left thigh and knee were found to be greatly swollen, the knee was semi-flexed and the foot slightly everted; one and a half inches above the upper border of the patella the lower end of the shaft of the femur could be distinguished; its anterior edge projected forward and was well defined; in the popliteal space a considerable projection was easily felt beyond the lower end of the shaft of the bone. Attempts were made both without and with chloroform on that day to reduce the deformity, but on the following day, Mr. Hilton, with the aid of chloroform, having extended the limb to the utmost, with considerable force pushed backward the shaft of the bone, and then secured the parts in that position by means of a back splint and strapping. A week afterwards, while lifting the lad to another bed, the apparatus got sufficiently disturbed to permit of a recurrence of the displace-

[1] Brit. Med. Journ., 1874, Vol. II, p. 402.

[2] Med. Times and Gaz., February 12, 1859.

ment, but the normal position was secured under chloroform with still greater difficulty than at first. Seven weeks from the date of accident the apparatus was removed, the bones being found firmly united; no thickening at the site of injury was perceptible, and the motions of the knee were perfect. In this case no crepitus was ever felt; but there could be little doubt as to the accuracy of the diagnosis.

CASE IV.—*Separation of Epiphysis with Torn Popliteal Artery and Vein; Amputation.*—Mr. HUTCHINSON.[1] A child, aged eighteen months, was run over in the street. Amputation was resorted to on account of the torn artery and vein. On dissection it was found that the lower epiphysis of the femur was completely detached and carried forward; there was extensive laceration and detachment of periosteum; the exposed surface of the epiphysis was covered with cartilage, but none was found on the shaft; some small spiculæ of bone had been broken off and carried with the epiphysis.

CASE V.—TAPRET and CHEUET.[2] A child of nine and a half years was sitting on the tail-board of a cart, when his leg caught in the wheel. A large transverse wound was caused at the posterior aspect of the knee, and much hæmorrhage ensued. He was found to have separation of the lower epiphysis of the femur. Amputation was performed.

CASE VI.—*Separation of the Lower Epiphysis of the Femur; Gangrene; Amputation; Recovery.*—WHEELHOUSE.[3] A boy, aged seventeen, was caught in some machinery and his leg was violently twisted round. A lesion low down in the shaft of the femur was diagnosed, but the displacement could not be rectified; gangrene set in after a few days, and amputation was performed. On examination the lower epiphysis of the femur had been torn from its connection with the shaft, but had remained almost *in situ;* the shaft had been driven into the popliteal space, and had so stretched the popliteal vein that gangrene was inevitable.

CASE VII.—A. F. MACGILL.[4] The patient, a boy, aged fifteen, while sitting at his work with his feet on the ground, centre-punching a boiler-plate, was struck on the lower end of the femur above the left knee by the heavy iron plate, which suddenly slipped. He was im-

[1] Trans. Path. Soc., Vol. XIII, p. 183.
[2] Bull. de la Soc. Anat. de Paris, June 10, 1875, p. 25.
[3] Brit. Med. Jour., 1885, Vol. I, p. 60.
[4] Med. Times, 1884, Vol. I, p. 695.

mediately disabled and unable to walk. On examination the left leg was slightly flexed and everted, with general swelling about the knee-joint. The anterior surface of the patella lay in a plane one and a half inches in front of the shaft of the femur; behind the patella could be felt a mass of bone corresponding in shape to the lower epiphysis of the femur, which, therefore, lay in front of the lower end of the shaft, the articular surface looking downward and forward; posteriorly the broken lower end of the shaft of the femur could be felt; the popliteal vessels were displaced backward, and could be felt beating under the skin; the measurement of the injured limb opposite the upper border of the patella was fourteen and seven-eighths inches, whereas on the sound side it was thirteen inches; shortening of the left limb, five-eighths of an inch; pulsation in the posterior tibial and dorsalis pedis arteries was unimpaired; under ether, the deformity was easily reduced by forcibly flexing the leg till the heel touched the buttock; the limb was placed on a back splint, and the patient made a perfect recovery.

CASE VIII.—*Separation, with Inflammation of Knee-joint and Excision of the Joint.*—CANTON.[1] W. J., aged fifteen, was playing with another boy, and, with a view of eluding him, was about to run under the body of a horse which stood close by. The animal, however, seeing him approach, rose on his fore-feet, knocked him down and kicked him violently above the left knee with one of his hind hoofs. On examination the affected limb was shortened, foot everted, leg slightly flexed, much swelling round the knee, and with such distortion of the parts as to give the impression of the tibia being displaced backward and outward; the inner femoral condyle appeared to project unduly, and the skin covering it was tense and abraded; crepitus was elicited; on the outer side and above the patella a forward elevation of bone could be felt. On account of the restlessness of the boy inflammation of the knee-joint set in with suppuration, so excision was performed. On examining the parts removed, the lower epiphysis was separated for about three-fourths of its circumference, while the remaining fourth was still firmly fixed in its normal position. An oblique fracture also extended through the substance of the shaft upward and outward from the line of separation. The patient *is said*[2] to have made a perfect recovery.

CASE IX.—*Compound Separation of Lower Epiphysis; Amputa-*

[1] Trans. Path. Soc., Vol. XI, p. 195.

[2] Italics are mine.

tion; Death.—HOLMES.[1] (Specimen is in the Museum of St. George's Hospital.) Boy, aged eighteen, was leaping from a pier on to a steamboat when his leg caught, and became entangled in a rope. There was a compound fracture of his thigh at the lower third, an extensive laceration of the skin in the groin, besides the injuries to the bone shown in the preparation. He died after operation from pyæmia. The lower epiphysis of the femur and tibia, and both of the fibulæ, were found separated.

CASE X.—CALLENDER.[2] F. W. P., aged eleven, sustained a severe lacerated wound on the inner side of the knee, together with separation of the epiphysis. This was caused by getting the leg entangled in the wheel of a cart while he was hanging on behind. There was firm union in six weeks without shortening of the limb. The boy was seen sixteen months later, and the growth of the femur had not been interfered with.

CASE XI.—M. COURAL.[3] A boy, eleven years old, fell forward while his leg was buried in a hole up to his knee, separating the lower epiphysis from the shaft, at the same time driving the shaft behind the condyles into the popliteal space. The epiphysis became tilted in such a manner that its lower extremity was directed forward. The limb was amputated.

CASE XII.—*Separation of the Lower Epiphysis of Femur and Upper Epiphysis of Tibia in a Child at Time of Birth.*—MALGAIGNE.[4] Madame La Chapelle mentions a case in which traction on the foot of a child in the act of birth caused a separation of the above-mentioned epiphysis. The child was born dead.

CASE XIII.—*Compound Separation of Lower Epiphysis of Femur, Secondary Hæmorrhage and Amputation.*—LITTLE.[5] A boy, aged eleven, while hanging on the back of a wagon had his right leg caught between the spokes of a wheel. Shortly after the accident Little found the upper fragment of the femur projecting through an opening on the upper and outer part of the popliteal space. The wound did not appear to communicate with the knee-joint. The fragments were reduced under an anæsthetic, the reduction occasioning a dull cartilaginous crepitus. There was at the time no pulsation

[1] Trans. Path. Soc., Vol. XIII, p. 187.
[2] St. Bart. Hosp. Rep., Vol. IX, p. 34.
[3] Hamilton, Fractures and Dislocations, p. 460.
[4] Quoted by Hamilton, op. cit., p. 460.
[5] New York Med. Journ., Nov., 1865, op. cit., pp. 460, 461.

in the posterior tibial artery. The limb was laid over a double inclined plane. Next day displacement was found to have occurred again, and the fragments could only be kept in place by extreme flexion of the leg. This position was therefore adopted and maintained.

Considerable traumatic fever followed, and secondary hæmorrhage on the thirteenth day. This arose from the anterior tibial artery near its origin; and it became necessary to amputate. The boy made a good recovery. The specimen showed that the line of separation had not followed the cartilage throughout, but had at one point traversed the bony structure.

CASE XIV.—Dr. VOSS, at the same meeting of the New York Medical Society at which Dr. Little presented his case, remarked that he had met with the same accident. There was no protrusion of bone, but an abscess formed; and it became necessary to amputate.

CASE XV.—Dr. BUCK also had seen a case which occurred in the practice of Dr. Hugh Walsh, of Fordham. The subject was a boy, aged fourteen years, and it occurred in the same way as in Dr. Little's patient.

CASE XVI.—HOLMES.[1] A boy, aged sixteen, fell from a height of eighty feet. The lower epiphysis of the femur was completely separated from the shaft and twisted upon itself. There was also a wound of the knee-joint. The thigh was amputated.

CASE XVII.—*Compound Separation of Lower Epiphysis of the Femur.*—ALCOCK.[2] A child, aged six years, got his leg entangled in the wheel of a carriage behind which he was riding. A large lacerated wound across the ham ensued, from which the shaft of the femur separated from the epiphysis and, denuded of periosteum, protruded. The patella was uninjured; reduction was then impossible; part of the protruding shaft was sawn off, and the remainder reduced; the limb was put up in the semi-flexed position; the limb was disturbed in the night, however, and the position altered. Finally, after a hard struggle for life, the wound healed with the leg at an angle of seventy-five degrees with the thigh, and the patient walked about with crutches. Alcock believed amputation would have been preferable, as he thought a lower limb much bent to be a greater evil than its total loss.

CASE XVIII.—PUZEY.[3] A. L., aged sixteen, was playing leap-

[1] Trans. Path. Soc., Vol. XIII, p. 187.
[2] Med. Chir. Trans., 1840, p. 311.
[3] Brit. Med. Journ., 1882, Vol. II, p. 788.

frog, and in alighting with his legs rather farther apart than usual, fell; on attempting to rise, he found his knee out of joint; on examination he looked as if he were the subject of a well-marked genu-valgum of the right knee; the leg was lying flat on the bed, but fixed at an angle of about 130° with the thigh; much fulness about the joint, and any attempt at movement caused great pain; under ether, the ordinary movements of the knee-joint were found to be free; and the inner and outer condyles bore their normal relations to the tuberosities of the tibia; but the leg remained fixed in its extraordinary position. On steadying the lower part of the thigh, and by gently pushing the leg towards the middle line, the deformity was reduced with soft crepitus.

Treatment.—The limb was put up on a Macintyre's splint, and an ice bag applied. The splint was kept on for seven weeks; and then the boy was allowed to move the knee. Result: Six months later he was found to have a good, straight limb, with perfect movement of the knee-joint.

CASE XIX.—SHEPPARD.[1] A boy, aged fifteen, was riding on the back rail of a cab, when his left leg became entangled in the hind wheel; he was thrown violently from his position into the road, and being unable to stand was taken to the hospital. On admission the left leg lay slightly flexed, and there was considerable displacement of the knee inward; on the front and inner side of the knee there was a rounded prominence, smooth to the touch, evidently the lower end of the shaft of the femur; the lower epiphysis of the femur was apparently projecting into the popliteal space, but it could not be felt there; the whole knee-joint, including the epiphysis of the femur, was displaced outward and backward; the upper fragment, or the shaft, was displaced forward and inward; some indistinct crepitus was felt on manipulation.

Treatment.—Reduction was effected by means of traction with the limb in the flexed position, and a hand behind the head of the tibia, combined with gentle manipulation of the projecting end of the shaft; the limb was placed upon a splint in a slightly flexed position. Result: Two months afterwards the movements were nearly perfect.

CASE XX.—*Compound Separation; Occlusion of Popliteal Artery and Vein; Stretching of Internal Popliteal Nerve; Anterior Dis-*

[1] St. Thomas's Hosp. Rep., 1878, p. 433.

placement of Epiphysis; Amputation; Recovery.—MAYO ROBSON.[1] A. B., aged fifteen years, had his leg crushed in a colliery accident. The circulation in the injured limb was impeded from the first, and on the forty-third day amputation of the thigh was performed for gangrene. The specimen is now preserved in the Leeds School of Medicine Museum, and shows the lower end of the diaphysis projecting into the popliteal space, and tightly stretching the large vessels and internal popliteal nerve; while the detached epiphysis is seen lying with its fractured surface on the front of the femur, its articular surface being directed forward; its anterior margin upward, and its posterior downward; the gastrocnemius is attached to the diaphysis.

CASE XXI.—*Compound Separation.*—MAYO ROBSON.[2] F. C., aged six years, was brought to the infirmary; the lower end of the diaphysis projected through a wound in the popliteal space; while the epiphysis was displaced downward and forward; amputation of the thigh was performed with good result.

CASE XXII.—MAYO ROBSON.[3] C. T., aged fifteen, while adjusting a belt, was caught up and whirled round a shaft several times; he was not brought to the infirmary till the next day, when the swelling was so extreme that no diagnosis could then be made.

As soon as the swelling had subsided there was found to be a fracture of the head of the left tibia; whilst on the right side the leg was thought to be dislocated forward; reduction was attempted under ether, but could not be effected; it was found later there was one and a half inches shortening of the thigh, with projection of the shaft into the popliteal space, and displacement of the epiphysis anteriorly on to the front of the shaft of the femur; ten weeks afterwards, with full antiseptic precautions, Mr. Atkinson made the usual incision for excision of the knee, and by means of a chisel and mallet detached the condyles from the front of the femur, where they had become firmly fixed, and sawed off the rounded end of the diaphysis and articular end of the tibia.

Museum Specimens.—Hunterian Museum,[4] No. 1041. "The bones of a knee-joint. The epiphysis of the femur was separated by

[1] Liverpool Med. Chir. Journ., Vol. III, p. 262. Under the care of Mr. Wheelhouse.

[2] Loc. sup. cit. Under the care of Mr. Hey.

[3] Loc. sup. cit. Under the care of Mr. Atkinson.

[4] Museum Catalogue.

violence from the shaft three years before amputation; the shaft was forced downward and backward. In this position a firm, smooth reunion has taken place with very little deformity or shortening. From a girl, aged eleven, whose leg was caught in a wheel; after the accident the knee was painful and swollen, and she halted in walking, but nothing particular ensued until three years after her apparent recovery from the accident, when a large abscess formed in the ham, and communicated with the knee-joint. For this the limb was amputated and the patient recovered.

"No. 1041 A. The lower end of the femur and knee-joint showing a separation of the lower epiphysis of the femur. The separation has not taken place cleanly, but a portion of bone has been broken off from the diaphysis. From a boy, aged twelve, who was severely injured a week before death, by his leg being caught in some machinery. The periosteum covering the lower third of the femur was separated by a collection of blood and pus from the bone.

"No. 1041 B. The lower end of a femur showing separation of the lower epiphysis with splintering of the shaft. From a boy who had sustained a severe injury by the wheel of a tram-car passing over his leg.

"In St. Bartholomew's Hospital Museum is one specimen.

"In Guy's Hospital Museum are three specimens, from boys, aged seventeen and fourteen, and one whose age is not stated. In the first two, the injury was caused by machinery accidents, and in the second case four inches of the shaft protruded through the skin. There was also fracture of the skull, and death ensued in two hours.

"In St. Thomas's Hospital Museum, there is one specimen from Sir William MacCormack, but no history is recorded. There is also a vertical fracture into the joint; at the outer part of the separated epiphysis is a large sequestrum.

"In the London Hospital Museum is one specimen taken from a patient who was run over.

"In St. George's Hospital Museum is a specimen of partial separation of the lower end of the femur with oblique fracture. The inner part of the epiphyseal line is separated, and running upward and outward is an oblique fracture through the diaphysis, separating off a small portion of the lower end of the femur. The specimen was taken from a baker's boy, aged fifteen, who caught his leg in a machine used in the process of bread-making. Amputation was performed immediately on admission. He died four days afterwards.

"Two other specimens are taken from cases described above. See Cases IX and XVI.

"In Charing Cross Hospital Museum is the specimen from which Case VIII is taken."

Remarks.—In considering these cases it will be well to note the anatomy of the parts. The epiphyseal line is directed slightly downward and backward, so that in the event of separation the lower fragment will often slip to the front of the shaft, which is displaced in the opposite direction. Assisting the displacement are the actions of the gastrocnemius and plantaris, which are attached to the shaft just above the epiphyseal line, and pull on it with considerable force. The epiphyseal line is just above the limit of the knee-joint behind, so that there is but little, if any, check to the displacement.

The ossific nucleus of this epiphysis appears at the ninth month of fœtal life, and is united to the shaft soon after the twentieth year. It is of great importance to remember that the proliferation of cartilage of this epiphyseal line is largely responsible for the growth in length of the limb.

Of twenty-seven instances, in which the sex is recorded, it occurred once only in a girl. The average age of the cases was thirteen and a half, the highest being twenty and the lowest one and a half years. Packard[1] says: "As far as I know, in all recorded instances the patients have been males and the ages under sixteen." He also states "the cause of this injury has been in almost every case, I believe, indirect violence." Let us examine the causes. In thirteen out of twenty-six instances, to which I have had access, the injury was due to the limb being entangled in a wheel, either by a patient riding behind a cart and getting his foot caught between the spokes, or else due to entanglement of the limb in machinery. On one occasion very severe injuries to a boy occurred by his jumping from a steamboat and getting the leg entangled in a rope. In this case at least four epiphyses were separated. Twice the injury was occasioned by slipping of the foot, the boys coming to the ground

[1] Loc. sup. cit., p. 216.

with their legs bent under them; once a push on the outer side of the right leg was sufficient to cause it when both legs were extended and nearly fully abducted. In one instance the patient was run over, but the exact position where the wheel passed over the limb is not stated; hence it is not possible to say whether the violence was direct or indirect. As instances of direct violence, the injury was caused in Case VII, by the blow of a heavy iron plate on the part, and in Case VIII, by a kick from a horse.

But, I think, the fact that in no less than thirteen out of twenty-six instances the history being so uniform and, indeed, identical—viz., a wheel accident, either of a cart or machinery—should lead us to suspect the nature of the injury, when occurring in boys at the age of twelve to sixteen. The giving way of the epiphyseal line under the influence of a twisting force shows that it is a weaker spot in the limb when placed in comparison with the ligaments of the knee-joint. Dislocation is infrequent in adults and very rare in children.

Symptoms.—(1) Pain may or may not be a striking feature of the case. Sometimes it is noticed to have been extremely acute, due, no doubt, to the sudden stretching of and pressure on the internal popliteal nerve.

(2) Crepitus,—although noted in some cases as soft and readily elicited, yet in most cases it was not obtainable, due, probably, to the fact that at the separated surfaces the line of solution is tolerably plain, and the fragments rub lightly over one another. Sometimes the separation was so great that the surfaces were not in contact.

(3) Deformity.—Once it was noticed that the limb had the position of a genu-valgum, and when the patient flexed the thigh, the knee-joint appeared higher up than usual. Generally, the knee was semi-flexed and the foot everted; the patella also being turned outward. Unfortunately, the total amount of shortening is not noted.

With reference to the position of the lower fragment, this is frequently displaced forward, and sometimes rotated outward or inward, while the lower end of the shaft projects backward in the popliteal space and forms a hard mass, somewhat rounded at its

extremity. But the smoothness of the lower end of the shaft will depend upon the exact site of separation. As a rule, this does not pass entirely through the growing line, but some fragments of the shaft come away with the epiphysis.

This frequent displacement forward of the epiphysis is a very striking feature of the injury, and is doubtless due to the position of the epiphyseal line below the attachments of the gastrocnemius, and its direction downward and backward.

(4) At the level of the upper border of the epiphysis there is a transverse depression on the front of the thigh.

(5) In some instances the patients, when lying down, were able to flex the thigh slightly.

(6) Age under twenty.

Diagnosis.—(1) From dislocation of the knee forward. Here the tibia presents a distinct projection in front of the joint, and above this there is a marked depression in which the patella is felt. The lower end of the femur forms another projection in the popliteal space, behind the head of the tibia, pressing upon the popliteal vessels and nerves so that severe pain is felt in the leg, and in many instances the circulation through the tibial arteries is found entirely arrested. The anterior and posterior projections, the pain and arrest of circulation simulate displacement of the epiphysis, but in dislocation the knee is extended not flexed, and on reduction the deformity finally disappears. In separation the relations of condyles, patella, and tuberosities are not altered, and great difficulty is experienced in maintaining the reduction. In addition, dislocation is a rare accident under twenty, as has been stated.

(2) From supra-condyloid fracture of the femur. In some respects the symptoms are alike. But in fracture, the lower fragment is drawn backward into the popliteal space by the action of the gastrocnemius, while the upper projects forward, whereas the reverse frequently obtains in separation. Another point is the character of the crepitus in fracture.

Effects and Results.—On integuments.—Of twenty-nine cases, no fewer than twelve, or nearly 41.4 per cent., were compound. In all cases, where protrusion of bone occurred, it was

the shaft, and that generally at the inner and posterior part of the popliteal space, and, less frequently, at the outer and posterior part.

On the joint.—In one instance it is mentioned that the joint was opened. As we might expect, the injury gives rise to great swelling of the knee, due to rapid effusion into the synovial membrane. This is noted as having occurred chiefly in cases due to indirect violence.

On the vessels.—In one instance these are described as being torn; in another, a great deal of hæmorrhage ensued, perhaps from a partial rupture of the popliteal vein or artery, and necessitated amputation. But the opportunity of thus verifying the cause of hæmorrhage was not taken. On another occasion it was found impossible to reduce the displacement, and, as the vessels were placed continuously on the stretch by the abnormal position of the shaft in the popliteal space, gangrene set in. As instancing the condition of the artery and vein, I might allude to a case of this nature in which the limb was amputated on account of the generally severe injuries. When it was dissected it was found that the popliteal artery at the upper end of the space, and corresponding with the level of the lower end of the shaft of the femur, was completely occluded. There was no rupture of the external coat, nor was there blood in its sheath. On slitting the vessel up, the interior was found full of clot, and the inner and middle coats were lacerated; the intima was rolled up and partly reflected, forming a little pouch. McGill observed, however, in Case VII, that, although the popliteal vessels were so much displaced, and could be felt beating just beneath the skin, the pulsation in the anterior and posterior tibial arteries was good. This points to the possibility of saving the limb even when the displacement is severe, if reduction be effected early.

On the nerves.—As the internal popliteal nerve is in so intimate a relation with the vessels, when the latter are stretched the former also suffers. This accounts for the severe pain felt in simple cases. In compound cases the shaft glides past the nerve, and so the pain is by no means so severe.

Other results are: Gangrene, which has already been alluded

to, diffuse suppuration and pyæmia. Amputation has frequently followed.

The union is generally good; but in one case it is noted that the position of the limb was very bad, the leg being bent at an angle of 75° with the thigh.

Generally the movement in the knee-joint afterwards is good, and shortening is very slight, not exceeding one-fourth of an inch some months later.

Treatment.—In simple separations the first thing to do is to effect reduction, and this is in all cases best effected by placing the patient under an anæsthetic. Considerable difficulty, however, was experienced by Mr. Poland, who acted for Mr. Hilton in Case III, and reduction was only successfully accomplished the next day, by forcibly extending the leg for a long time and then pushing the shaft of the femur forward. McGill succeeded by flexing the leg until the heel touched the buttock.

In Puzey's case, where the epiphysis was displaced outward, reduction was effected by gently pushing the leg towards the median line. Sheppard found that a combination of movements was most successful, and so employed traction with the limb in the flexed position, and the hand behind the head of the tibia combined with gentle manipulation of the projecting end of the shaft. When replacement is secured it is by no means easy to maintain.

As to splints.—Liston's or Desault's back and two side splints, or Bryant's splints have all been used, but I should be inclined to recommend Bryant's splint for the first four weeks and then put on Croft's plaster-of-Paris splint until the union is firmly consolidated. In compound cases every effort should be made to reduce the deformity, even to the extent of sawing off a small portion of the diaphysis, since the cartilage usually goes with the epiphysis, and the wound should be rendered antiseptic. Bryant's double splint will be found very useful until the wound has healed.

The indications for amputation are: Other severe injuries in the same limb, from which it would seem impossible for the patient to recover; when the popliteal vessels are so injured at the time of accident that the circulation is completely arrested, and when gangrene is impending or has already set in.

SEPARATION OF THE UPPER EPIPHYSIS OF THE TIBIA.

The literature of this injury is very scanty, and I am able from general sources to present only seven instances; but many cases of this and allied injuries await publication from the case-books of large hospitals.

CASE I.—MANLY.[1] A young man, aged twenty, when riding a bicycle, collided with a hansom cab and was thrown off. He struck the inner side of the left knee. On examination there was a good deal of effusion into the joint, and below the knee on the inner side a distinct edge could be felt, apparently the upper edge of the diaphysis of the tibia; by manipulation this projection could be obliterated and distinct movement obtained between the epiphysis and shaft of the tibia, accompanied by a slight cartilaginous crepitus; the limb was put up in plaster of Paris and did very well.

CASE II.—HEUSTON.[2] A boy, aged eight years, was caught by the leg between two desks. In attempting to wrench the limb free the accident occurred. At the time there was but little pain and he was able to walk home. A large amount of swelling occurred. On examination I found all the local evidences of acute synovitis of the knee, while free movement could be obtained between the upper epiphysis of the tibia and the shaft; there was, however, no crepitus.

CASE III.—*Separation of Upper Epiphysis of the Tibia by Extension (?)*—J. JONES.[3] A boy, aged fifteen, with hip-joint disease, was treated by extension. Two months afterwards a grating could be felt and deformity appeared just below the knee-joint, which was found to be due to separation of the upper epiphysis of the tibia. "I ascribe the lesion to the pull of a seven-pound weight." On removal of the weight good union occurred with the aid of rest and a back splint. Result:[4] The patient at the present time is in excellent health but pallid; the total lameness of the limb is two inches, of which three-fourths of an inch occurs below the knee and due to the separation, a striking example of the arrest of growth of the bone on being separated from its epiphysis.

CASE IV.—STIMSON.[5] A child, eighteen months old, was run

[1] Brit. Med. Journ., September 22, 1888.
[2] Brit. Med. Journ., July 21, 1888.
[3] Lancet, Vol. I, 1881, p. 282.
[4] Lancet, Vol. I, 1883, p. 403.
[5] Med. Rec., July 15, 1882.

over by a "horse-car," and the upper epiphysis of the tibia was completely separated from the shaft; the upper end of the shaft was denuded of its periosteum, which was adherent to the epiphysis.

CASE V.—See Case XII, of *Separation of Lower Epiphysis of the Femur*, in which the two injuries co-existed.[1]

Museum Specimens.—One in the Museum of the Episcopal Hospital, Philadelphia. A specimen from a boy whose leg was so crushed that it was necessary to perform amputation, figured by Ashhurst.[2]

Specimen in the Hunterian Museum, contributed by the author. Unfortunately no history was obtainable in this case, as it was found among a number of discarded specimens given to me from a private collection.

Remarks.—From the above and following notes it will be seen that there are seven cases—some of which are doubtful—recorded, and two specimens at least are in museums. The injury has been verified by dissection in Madame La Chapelle's case, in Ashhurst's case and in Klein's case. The injury is due in some cases to direct, and in others to indirect, violence.

Symptoms.—In addition to the cardinal signs of broken bone, the chief points are the age, under twenty, the backward displacement of the upper epiphysis, and the recurrence of the deformity after reduction; the movements of the knee-joint, too, are normal and free under the administration of anæsthetic.

Diagnosis.—Difficulties can only arise when there is much swelling about the parts, so as to obscure the outline of the bones. The displacement cannot be very severe because in the first place of the tongue-like shape of the lower and anterior margin of the epiphysis and the splint-like action of the upper part of the fibula, the head of which articulates with a facet which is part of the epiphysis of the upper end of the tibia. What displacement there is will exist mainly, therefore, on the inner side. The complications are effusion into the knee-joint, shortening, about three-fourths of an inch some time afterwards in Case III, and in two instances only was it necessary to amputate.

[1] See also Separation of Lower Epiphysis of Tibia, Case II, and Separation of Lower Epiphysis of Tibia with Fracture of Lower End of Fibula, Case I.

[2] Prin. and Prac. of Surg., 3d Ed., Figs. 132 and 133.

Treatment consists in the use of back and side splints, or Croft's splint kept on for six weeks.

Separation of Lower Epiphysis of the Tibia.

This is a rarer injury than separation of the lower epiphysis of both tibia and fibula, or separation of the tibia with fracture of the fibula. These combinations will be spoken of in a later part of the article.

Case I.—R. Quain.[1] On October 22, 1851, a boy of seventeen was admitted into University College Hospital. He stated that, while dragging a piece of iron about twelve feet long, he slipped and fell, the left foot being doubled under him. On examination the lower end of the shaft of the tibia projected forward. This projection was found to be one and a half inches higher than the lower margin of the fibula and three-quarters of an inch above the tip of the internal malleolus; the space between the prominent edge and the end of the great toe on the injured side measured three-quarters of an inch less than on the sound side; the ankle-joint was uninjured, the edge of the displaced bone was rounded and smooth; there was but little swelling; the replacement of the bone and the treatment by means of "starch apparatus" presented no difficulty, and no circumstances requiring notice.

Case II.—*Compound Separation followed by Necrosis of Part of the Epiphysis; Recovery.*—Voss.[2] Dr. Voss remarked that he had seen a case of separation in this position in a boy of fourteen years old, who, in falling, had caught his foot between two blocks of wood. The upper fragment protruded through the skin; reduction was effected, but subsequently a portion of the epiphysis became necrosed and was removed; he finally recovered with a useful joint.

Case III.—R. W. Smith.[3] A similar accident to the preceding occurred in a boy sixteen years of age. It was seen by Smith six months afterwards, and found to be unreduced; the lower end of the shaft was displaced forward.

Case IV.—*Compound Separation; Good Union; Good Movement in Ankle-joint.*[4]—J. W., aged thirteen, was admitted with what

[1] Brit. Med. Journ., August 31, 1867.
[2] N. Y. Med. Journ., November, 1865, p. 133.
[3] Brit. Med. Journ., August 31, 1867.
[4] Glasgow Med. and Surg. Journ., November, 1886.

appeared to be a compound dislocation of the left ankle. On examination it was found that the joint was not implicated and that the lesion was a compound diastasis at the lower end of the tibia. The shaft had been forced through the skin, making a wound on the inner side of the leg above the ankle about two inches in length by one and a half inches in width. The periosteum was stripped off the shaft for about one inch, and was so lacerated that it was impossible to get it to cover the bone; where uncovered, the bone was pale, but marked by bright, red spots at the openings of the vascular channels; the fibula was not in any way injured.

The wound was dressed antiseptically and side-splints applied.

Five weeks afterwards the patient was dismissed with an excellent limb, the movements of the ankle-joint were perfect, and there was no measurable shortening. On careful inquiry, the following was found to be the cause of injury: He was standing on the tramway in a mine, when a "hutch" came unexpectedly up and struck him on the outside of the left leg, about the middle; the foot was resting on the sleeper, and was supporting the weight of the body, so that the force caused the lower end of the diaphysis to be driven through the skin.

CASE V.—MR. HOLMES, *vide* Case IX, of *Lower Epiphysis of Femur; Compound.*

Museum Specimens.—Hunterian Museum, No. 1103. "Part of a tibia. The lowest portion appears to be the lower end of the shaft; it was separated from its epiphysis and protruded; it was sawn off; the other portions of the specimens were afterwards exfoliated. Specimen contributed by Sir Astley Cooper."

Middlesex Hospital Museum. A separation of the lower epiphysis of the tibia in a child.

Remarks.—The cause was generally indirect violence and the injury occurred in boys. The symptoms are graphically described in the case recorded by Quain.

Diagnosis.—From partial dislocation of the ankle outward, as in Pott's fracture. If there be but little swelling at the time the symptoms of the latter injury are sufficiently obvious, the fracture of the fibula, the prominently projecting internal malleolus, if unbroken, or, if broken, the separated fragment and the crepitus of a true bony nature are sufficient distinctions.

From Dupuytren's fracture of the fibula, the diagnosis is rather obscure; as in addition to the fractured fibula, a slip of the tibia may be torn off with the strong inferior tibio-fibular ligaments, and the tibia is sometimes forced through the skin on the inner side, rendering the injury compound. But here, as in Pott's fracture, if the swelling is not great, the fact there is a co-existent fracture of the fibula is sufficient for diagnostic purposes in the case of separation *alone* of the lower tibial epiphysis. In compound cases, either of dislocation of the ankle itself, Pott's fracture, or a separation of the epiphysis, exposing to the eye the bone, all chance of error in diagnosis is removed. But in Quain's case it is especially noted that there was a remarkable absence of all swelling about the ankle-joint.

Complications and Results.—The ankle-joint escapes injury. In two instances the lesion was compound, but in one of these, Clark's, although the periosteum was stripped off the shaft for one inch, it is especially noted that there was no shortening, and perfect movement of the ankle-joint was obtained in six weeks. Case III is an instance of deformity arising from non-reduction. In no instance does the posterior tibial artery or nerve appear to have suffered. Mr. Holmes's case of multiple separation of the epiphysis succumbed from pyæmia after amputation.

Treatment.—In the first place reduce the deformity by extension and counter-extension; then place the limb in a Croft's splint. In compound cases, I think that fuller details of Case IV than are quoted above, but which appear in original article, present ideal treatment. "The wound was well washed out with solution of corrosive sublimate and dressed with carbolic gauze and a good wood-wool pad applied and back and side splints fitted. When dressed six days after admission, the dressings were simply stained with blood. From this time the dressing was unchanged for twenty-four days, when it was removed during the visit of the local branch of the British Medical Association."

Separation of the Upper Epiphysis of the Fibula.

Hamilton[1] was unable to find any record, but Stimson has contributed the following notes of a case:

[1] N. Y. Med. Rec., 1882, Vol. xxii, p. 77.

A child, eighteen months old, was run over by a "horse-car," and received injuries which caused its death some hours afterwards. The right leg was badly lacerated, and the knee-joint was opened from the outside; the upper epiphysis of the fibula was completely separated from the shaft; the specimen was interesting with reference to two points. Firstly: The upper end of the shaft of the fibula was entirely denuded of periosteum. He had seen that fact recorded in other cases, and perhaps it had something to do with the not infrequent occurrence of suppuration after such an injury. Secondly: The separation was clean and without fracture of the bone proper.

Separation of the Lower Epiphysis of the Fibula.

Again I have been able to come across but one example of this injury existing by itself, and not associated with the separation of the lower tibial epiphysis.[1]

A boy, aged eight, was caught by the leg in some machinery, and the soft parts sustained a very extensive laceration. "After amputation there was found a disjunction taking place at, and coinciding exactly with, the width of the epiphyseal line, leaving the shaft of the fibula intact." Hamilton says: "I have not been able to meet with a single case."

Simultaneous Separation of the Lower Epiphysis of the Tibia and Fibula.

Case I.—Adams.[2] A boy, aged fourteen, in jumping off a bar of iron caught his toes, and fell forward with much violence, so that the lower epiphysis of tibia and fibula on the left side were detached, and then dragged backward with the foot of the patient. The strength of the lateral ligaments of the joint will account for the occurrence of this lesion rather than dislocation. Had the patient been an adult, dislocation would probably have ensued, in the place of diastasis. The symptoms were well marked, especially the projection forward of the lower end of the tibial shaft. Both Adams and Ward concurred in the diagnosis. Reduction was effected with considerable difficulty, and splints were applied.

Case II.—Fischer; Hirschfeld.[3] Specimen taken from a

[1] Path. Soc. Trans., Vol. xxxv, p. 272, and is recorded by Mr. Bland Sutton.

[2] Med. Times and Gaz., February 12, 1859.

[3] Berliner klin. Wochen., 1865, p. 63.

youth, seventeen years of age, in whom the lower epiphyses of the tibia and fibula were found to be torn away near the epiphyseal line, and there was also separation of the upper epiphysis of the tibia.

CASE III.—ANGER.[1] A youth, fifteen years of age, got his leg entangled in machinery; the lower epiphyses of the tibia and fibula were separated; the shaft of the tibia was broken at the outer side.

CASE IV.—CORNER.[2] A boy, aged fourteen and three-quarter years, was seated on the tail-board of a cart, which gave way; he alighted on his feet, the injured foot turning inward; the symptoms were great swelling about the ankle-joint and deformity looking like dislocation of the foot backward, the os calcis being drawn backward and upward; on tracing the crest of the tibia a depression was felt from one to one and a half inches above the ankle-joint, and some motion at this part was noticed on pretty forcible manipulation, but there was no crepitus; the external malleolus pointed more posteriorly than on the opposite side; the limb was placed in Luke's swing apparatus, but the os calcis was still displaced; on the leg being flexed and placed in a splint on its outer side, displacement was reduced.

CASE V.—*Separation of Lower Epiphysis of the Tibia on Right Side, and Fracture of Fibula, with Compound Fracture of Os Calcis and Scaphoid; on Left Side Separation of Lower Epiphyses of Tibia and Fibula, and Comminution of Os Calcis.*—HUTCHINSON.[3] A sailor, aged nineteen, was standing on a rope under a yard unfurling a sail as his ship was leaving the dock; his foot slipped, and he was left hanging to the yard by his hands; he held on till he was exhausted, and then fell to the deck, coming heavily on his feet; the height was about twenty or thirty feet; on admission a lacerated wound three inches long was seen on the inner side of the right foot, and through this wound a comminuted fracture of the os calcis could be felt; on both sides there was separation of the lower ends of the tibia and fibula; both feet were displaced backward, carrying with them the lower ends of the tibia and fibula; reduction was easily effected, and a good position maintained by outside splints and footpieces; seven days afterwards he had an attack of erysipelas, of

[1] Traité des Malad. Chirurg., Paris, p. 18.

[2] Med. Times and Gaz., March 5, 1859.

[3] Lancet, 1875, Vol. II, p. 857.

which he died; the nature of the lesions was verified by post-mortem examination.

Remarks.—It has been thought better to group these cases together, as they can be more readily and concisely dealt with. I have given notes of three cases and brief notices of two cases. In all instances the injury was probably due to indirect violence. The ages were fourteen, seventeen, fifteen, fourteen, nineteen.

Symptoms.—In four instances the foot was displaced backward, and there was a forward projection of the tibial shaft. Below this there was a depression from one to one and a half inches above the ankle-joint; and the outline of the lower part of the fibula was interrupted just above the external malleolus. There was also some motion at these points. No crepitus of any kind was felt.

The carrying backward of the foot with the displaced epiphysis was due to two causes,—the direction of the violence, and the action of the gastrocnemius and soleus on the os calcis.

Diagnosis.—From backward dislocation of the ankle: In separation, on tracing the tibial crest from above downward, it will be felt to cease abruptly about one inch above the ankle, and the outline of the fibula will also be interrupted; further, the fibula has lost its spring. On measurement from the tips of the internal and external malleoli to the bases of the first and fifth metatarsal bones on both sides, there will be no difference; whereas, in dislocation forward there will be decrease on the injured side. Difficulties will arise if a great amount of swelling suddenly ensue; but if, as in Case I, the patient can be seen before the swelling supervenes, the diagnosis does not present great difficulty.

Effects.—As to the subsequent position and appearance of the limb it should be further noted in Case I that Adams says, "firm union took place, and the boy left the London Hospital with a very good leg." There is no history of any implication of the ankle-joint.

Treatment.—By flexing the leg on the thigh and applying traction to the foot, reduction can be very easily effected, and an outside splint with foot-piece, or a Croft's splint, is all that is necessary.

Separation of the Lower Epiphysis of the Tibia, with Fracture of the Fibula.

Case I.—*Separation of Lower Epiphysis of Tibia, Fracture of the Fibula, Compound Separation of the Upper Epiphysis of the Tibia; Amputation; Death.*—E. Klein.[1] A boy, thirteen years of age, was injured by a threshing-machine; death, three-quarters of an hour afterwards, from collapse. The above lesions were found.

Case II.—Wade[2] (reported by R. W. Smith). There was compound separation of the lower epiphysis of the tibia, a large wound existing at the inner side of the leg, with much bleeding. There was also fracture of the fibula. Primary amputation was performed.

Case III.—*Compound Separation, followed by Gangrene, Pyæmia and Death.*—P. Bruns.[3] A youth, aged seventeen, fell between the spokes of a wagon-wheel; there was separation of lower epiphysis of the tibia, with splintering and diaphysis; this was compound; there was also fracture of both femora; gangrene of both legs ensued, and death took place in nine days, from pyæmia.

Case IV.—Martin.[4] A boy, eleven years of age, fell from a height. At the inner side of the leg the diaphysis of the tibia protruded, the periosteum being stripped off for about one and a half inches; the fibula was also fractured, replacement was effected with much difficulty; the wound was healed in two months.

Case V.—*Compound Separation of Lower Epiphysis of Tibia, with Fracture of Fibula.*—Clark.[5] A boy, aged thirteen, was admitted into the Infirmary with what was at first supposed to be a compound dislocation of the ankle. He had been struck on the inner side of the leg by a large sheet of iron. On examination there was found to be a wound about two inches in diameter, much lacerated,

[1] Inaug. Dissert., 1854.
[2] Dublin Quart. Jour., 1852, Vol. xiii, p. 202.
[3] Langenbeck's Archiv, B. xxvii, p. 276.
[4] Boston Med. Jour., 1877, Vol. ii, p. 127.
[5] Glasgow Med. Jour., 1886, Vol. ii, p. 329.

and through which protruded the end of the shaft of the tibia; this was rounded and had no appearance of fracture; the periosteum was completely stripped off the bone for about two inches on the inner side, and somewhat less on the outer; the ankle-joint was uninjured, so also were the tibial arteries and nerves; the fibula was fractured about two inches above the tip of the external malleolus. To reduce the deformity it was found necessary to resect three-quarters of the exposed shaft; the wound was dressed antiseptically, but suppuration took place, and the wound healed by granulation. Two years afterwards the boy was seen again, and there was found to be a shortening of two centimetres, that is, nearly the amount resected in reducing the displacement immediately after the injury. It would, therefore, appear that there was but little, if any, arrest of the growth of the limb, as the lad himself had grown considerably in height during the interval. The movements of the ankle-joint were perfect, and the patient could bear all his weight upon the limb.

Remarks.—It is curious to note that all the cases were compound. The causes were wheel accidents or the fall of a large sheet of iron on the inner side of the leg. The diagnosis, in most of the cases, was easy, since the ends of the bones could be either seen or felt, although Clark's case was at first supposed to be a compound dislocation of the ankle. In a simple case there would be no little difficulty in diagnosing it from a Pott's fracture, but in the latter case the continuity of the anterior margin of the tibia is not destroyed. Then again, it will be found that in separation, the *whole* of the lower extremity of the tibia goes with the foot, whereas in Pott's fracture the internal malleolus alone is broken off, as a rule. Dupuytren's fracture of the fibula is diagnosed by the fact that, when the foot is moved outward, the internal malleolus does not go with it as in separation.

Effects and Results of the Injury.—In all the quoted cases it was compound. On the vessels and nerves: In Case V they were exposed and uninjured; in Case II there was very free hæmorrhage, but the origin of it is not stated. Judging from the fact that amputation was soon performed, it is probable that one or both the tibials were damaged. Among the other effects of the injury the stripping of the periosteum off the shaft of the tibia should be noticed. This is explained in nearly all cases by

the peculiar disposition of the periosteum at the epiphyseal line. If this membrane be traced from the shaft towards a joint it will be seen to divide at the epiphyseal line into two processes, one the stronger, which turns inward and blends with the cartilage of the growing line, and the other, which passes over the epiphyseal bone to blend with the capsule of the joint. So that the end of the shaft is surmounted by a cap of periosteum and epiphyseal cartilage. The periosteum remains more firmly attached to the epiphyseal line than to the shaft, hence the partial denudation of the latter.

Treatment.—After reducing the fragments and rendering the wound aseptic, the leg should be put up in a back and two side splints. Amputation is called for if both tibial arteries are lacerated, and if there be extensive injury in other parts of the limb.

Separation of the Epiphysis of the First Phalanx of the Great Toe.

Gascoyen.[1] A child, aged eight, three months previously, while at play, got the great toe fixed under a door and struggled hard to release it. On examination it was found that the head of the metatarsal bone of the great toe was unnaturally prominent, and the extensor longus pollicis tendon extremely tense, the end of the toe being raised; there was a little pain on manipulation, but no grating; the head of the metatarsal bone could be felt intact with a rounded *movable* piece adherent to it, upon which the toe appeared to play; extension completely reduced the deformity, which returned when the extension was removed. Gascoyen, accordingly, made the diagnosis of separation of the epiphysis of the first phalanx of the great toe, and divided the extensor longus pollicis tendon; after the wound was healed, the foot was put into a gutta-percha splint, which was firmly moulded to the toe. The child did well, and in three weeks was able to walk about almost naturally, whereas, at first, the position appears to have been that of talipes equino-varus.

Remarks.—It is to be regretted that in an obscure unique injury such as this, the opportunity afforded by operation was not taken to verify the precise nature of the injury. But the case occurred in the pre-antiseptic days.

[1] Brit. Med. Journ., 1871, Vol. 1, p. 338.

PLATE I.

ILLUSTRATING SOME OF THE CHANGES OBSERVED IN ACUTE APPENDICITIS.[1]

FIG. 1.—Appendix removed twenty-nine hours after commencement of attack. Gangrenous and perforated at the distal extremity. The dark body in the cavity at the tip is a fresh blood-clot resulting from the involvement of one of the branches of the appendicular artery in the gangrenous and perforating process. The appendix, in this case, was unusually free from surrounding inflammatory conditions, adhesions, etc. The perforation had taken place into the unprotected peritoneal cavity and a violent septic general peritonitis was under way. No foreign body, or even inspissated fæcal matter was present.

FIG. 2.—Appendix removed twelve hours after the commencement of the attack. The appendicular artery in this case extended to the distal extremity of the organ before giving off any branches. It was then reflected in the submucosa, and gave off its branches in a direction toward the base of the organ. The vessel is seen to be occluded by a thrombostasis a short distance from its tip.

FIG. 3.—External surface of an appendix imbedded in inflammatory material and perforated about half an inch from its distal extremity.

FIG. 4.—The same appendix incised longitudinally, the line of incision crossing the point of perforation. The wall of the appendix is shown, thickened at its upper or proximal extremity and about five-eighths of an inch from the latter. A stenosis exists, the cavity beyond which had undergone some dilatation. The mucous membrane is seen to be gangrenous (green) and necrotic (yellowish-white) in spots. The larger perforation is shown in the broken line of the edge of the incised mucous membrane. Another and smaller perforation is present upon the opposite side and nearer the tip. This was a chronic relapsing case, operated upon in an acute relapse.

[1] These colored sketches were made by the artist from the fresh specimens immediately after removal.

Plate I.

Fig I

Fowler on Appendicitis

Fig II

Fig III

Fig IV

DRAWN FROM NATURE BY F.A.DECK

OBSERVATIONS UPON APPENDICITIS.

By GEORGE RYERSON FOWLER, M.D.,

OF BROOKLYN,

SURGEON TO ST. MARY'S HOSPITAL AND TO THE METHODIST EPISCOPAL HOSPITAL.

[CONTINUED FROM PAGE 171.]

The Prognosis of Appendicitis.

THE prognosis of appendicitis is unfavorable in the cases treated non-operatively in proportion to the severity of the infection; and in the cases treated surgically in proportion to the delay in instituting operative interference.

While there are doubtless many cases of endo-appendicitis of a mild character which recover, it is equally true that a very large number of the cases which are lost, both with and without operation, were mild cases in the beginning of the attack. The disease may pursue an exceptionally rapid and uninterrupted course to a fatal termination in thirty-six hours from the beginning of the attack, as is exemplified by the following case:

O. P., aged fifty-eight, was admitted to St. Mary's Hospital at 9 P.M. on April 27, 1892. He was found by the ambulance surgeon sitting in a saloon suffering from acute abdominal pain. He had first felt the pain while straining at stool just before starting for work that morning. A diagnosis of appendicitis was made, and he was removed to the hospital for operation. He was given a hypodermatic injection of morphine on the way to the hospital. This caused so much relief that he afterward refused operation, although it was repeatedly urged upon him during the next twenty hours. The temperature, which upon admission was 102° F., fell, after the full effect of the opiate was obtained, to 99° F., and there remained. He was seized with severe pain at 6.30 P.M. of the day following, and died in collapse

within half an hour, just thirty-six hours after the first evidence of the disease. The pulse just before this was 120.

The autopsy, conducted by Dr. Clayland, the assistant pathologist of the hospital, revealed a perforated appendix and a rupture of a large, encysted, sero-purulent collection into the general peritoneal cavity.

If this case be taken as a type, and the period of time from the administration of opium to the final catastrophe be lengthened from the second to the fifth day, a large number of the cases formerly treated would be included in its class.

In the heretofore indifferent position of the profession towards this disease, the cases which were more or less acute in the commencement, but which became subacute in a few hours, were next gravest in character. These are cases in which the opium treatment is not necessarily to blame for allaying the anxiety that would naturally be felt by the practitioner when the gravity of the conditions present was fully recognized. They are rather cases in which necrotic changes in the mucous membrane follow a simple endo-appendicitis. Infection of the sub-mucosa takes place, and a renewal of the symptoms depends upon the supervention of a parietal appendicitis, either serous or suppurative. Involvement of the peritoneum (the peritoneal stage of Talamon), or the occurrence of a septic thrombosis and gangrene of the organ follows. The following case is a good example of such a condition of affairs :

J. L., a Swede, was admitted to St. Mary's Hospital with a history of having been suddenly attacked with severe abdominal pain, while lifting a heavy cake of ice, forty-eight hours previously. He had taken a cathartic for the relief of the pain; no other medicine had been administered, Dr. F. E. Wilson was finally summoned, and found the patient sitting up. He complained of pain in the right iliac region. The pain was not severe, nor did the pulse (96) and temperature (100° F.) indicate a severe grade of the disease. He was ordered to go to bed until the arrival of the ambulance. This injunction he did not obey, and the ambulance surgeon found him sitting in a chair. His friends said he had been up and down stairs several times during the day.

He was made ready for operation immediately after his arrival at the hospital. The usual right lateral incision revealed sero-purulent fluid free in the peritoneal cavity; very scanty adhesions were present. Septic peritonitis was already under way; an appendix perforated at about three-fourths of an inch from the tip, and gangrenous for about one-fifth of its length, was removed. All this had occurred within sixty hours from the beginning of the attack. The patient died from the septic peritonitis which was present at the time of the operation.

The striking feature about this case was either the absence of symptoms proportionate to the gravity of the conditions present, or the indifference of the patient to the pain that one would naturally expect to be present in such a case. This form of the disease is calculated to cause the physician to hesitate in the diagnosis, and much valuable time is therefore lost.

Talamon has asserted that this subacute form of the disease corresponds most frequently with the class of cases in which the inflammation occurs in an appendix not covered posteriorly with peritoneum, and in which, therefore, perforation may occur into the retro-cæcal connective tissue outside the peritoneum. The unfavorable prognosis in this class of cases is due, in his opinion, to the extra-peritoneal suppuration, which, without any obstacle to its advance, infiltrates the neighboring muscles and tissues, and provokes formidable and fatal complications. While I am willing to admit the dangerous character of this, as well as of any other form of the disease, in my experience the cases which become subacute after having been acute, as well as the cases which have been subacute from the commencement, and in addition those in which "cures" are attempted by the use of opium, are all equally and exceedingly dangerous. As an example of the latter class the following case, in which some particularly sad features were present, may be cited:

W. R., a medical student, was suddenly attacked with pain in the abdomen, referred to the right iliac region. A chill accompanied the attack, and vomiting followed it. The temperature was 101° F., and the pulse 98. The young man himself made the diagnosis of

appendicitis, and a neighboring practitioner was summoned by the family. This practitioner succeeded in shaking the young student's confidence in his own diagnosis, and the patient was given as treatment three grains of morphine and ten grains of calomel daily. He seemed to improve, but on the sixth day another attack occurred. From this he again improved under a continuation of the same treatment. On the eighth day another advent of acute pain was followed by collapse. He was seen by Dr. R. W. Sharp, who confirmed the young man's original diagnosis, and afterwards by Dr. Delatour. He was carefully removed to the Methodist Episcopal Hospital for operation, but his condition never improved sufficiently to warrant it.

In my judgment, the only cases treated non-operatively in which the prognosis can be said to be favorable are those in which the disease is neither progressive nor stationary, but, on the contrary, is retrogressive within the first twenty-four hours after the attack, as evinced by the symptom of tenderness—providing this latter has not been masked by the administration of opium or some of its derivatives. If, on the one hand, these indications are fulfilled, the attendant may encourage the patient that he will recover without operation; but, on the other hand, both will lean upon a broken reed, if reliance is placed upon any or all of the other symptoms. To sum up the whole matter, therefore, the prognosis, in cases in which no operative interference is instituted, is always uncertain; particularly so in cases in which the first symptoms subside and recur, as well as in cases which are subacute from their commencement.

The mode of termination may be: (1) By perforation, prior to the formation of proper adhesions, and thus giving rise to septic peritonitis; (2) infection of the peritoneum through the lymphatics or other channels of migration for the *bacillus coli communis* and other micro-organisms. In these cases the serous effusion may be (*a*) encysted, and subsequently become purulent; or (*b*) non-encysted, and occupy the general peritoneal cavity. In either case suppurative changes may occur. In the case of the encysted variety, a secondary rupture of this will lead to a rapidly fatal general septic peritonitis. (3) The rupture of an appendicular abscess, and consequent peritonitis. (4) Septic complications, arising from extension to and infection of the post-

peritoneal connective tissue. (5) Gangrenous inflammation of the appendix, of the adhesions which surround it, and of the neighboring parts including the blood-vessels, giving rise in the latter case to fatal hæmorrhage. (6) Pylephlebitis, hepatic abscesses with their sequelæ (purulent pleuritis from extension, pneumonia, etc.). (7) The purulent accumulation may open into the cæcum, rectum or bladder, and the patient perish from septo-pyæmia, due to repeated infection of the original abscess cavity from these sources.

The mode of death may be from shock and collapse, as happens occasionally in cases of sudden primary perforation (perforation of the appendix without pre-existing adhesions). This condition supervenes, however, much more frequently in secondary perforation (rupture of appendical abscess, or encysted sero-purulent deposit). Septic peritonitis will destroy life by the combined effects of its own septic products, and a stercoræmia, resulting from the intestinal paresis which follows in its wake. The effects of these septic products are most pronounced upon the circulatory organs, as evinced by the paralysis of the inhibitory cardiac nerve apparatus. Complications and sequelæ both of the disease and of the operative procedure will bring about a fatal result by methods peculiar to themselves.

The prognosis in cases subjected to operative interference will vary with the stage of the case at which the operation is undertaken, with the conditions found when the abdominal cavity is opened, and with the skill of the operator both in the manipulative technique and in the judicious employment of antiseptic or aseptic measures. There are some unfortunate sequelæ of laparotomies for appendicitis as well as for other conditions requiring the opening of the peritoneal cavity, which will be referred to later on.

All of the conditions heretofore mentioned that bring about a fatal termination may produce death after surgical interference, provided they were present before it. In other words, the operation will fail to rescue those already doomed by the existence of septic peritonitis, or septo-pyæmic general infection.

The prognosis after operation in the chronic relapsing cases

is generally good. In twelve cases operated upon by Bull[1] one proved fatal. In sixty-four cases collected by the same writer, occurring in the practice of other surgeons, not a single death is recorded. Kümmel[2] reports twelve operations, and no deaths.[3] Quénu[4] reports four additional cases operated upon by himself, all of which recovered. To this are to be added eighteen cases in my own hospital service, one of which proved fatal from a co-existing ulcerative enteritis.

The prognosis in cases of this type of the disease not operated upon cannot, in the absence of definite knowledge upon the subject, be definitely stated. Whether or not the appendix ever fully recovers itself after one or more relapses is a question which cannot yet be answered. In any case radical operation is more trustworthy than waiting for nature's uncertain methods, and therefore every patient who suffers from chronic relapsing appendicitis should be encouraged to submit to an appendicectomy.

With regard to the prognosis after the occurrence of one or more of the unfavorable conditions heretofore mentioned, it may be said in a general way, that the element of time will, as a rule, govern the fate of these cases. For instance, a perforation may occur, and yet the surgeon may luckily have succeeded in opening the peritoneal cavity before the escape of any of the contents of the tube. The following case will illustrate this point:

Miss M., aged twenty-two, a patient of Dr. Cruikshank, was placed by him under my care for operation, after a consultation of medical men had advised delay in the case. The usual right lateral incision revealed an appendix free in the abdominal cavity, absolutely without adhesions, swollen to the size of the little finger, and perforated in two places. The latter were minute openings, through which soft fæcal matter oozed as the ligature was tightened about the base of the organ preliminary to its excision. The patient made a good recovery.

[1] Medical Record, New York, March, 1893.

[2] Archiv für klinische Chirurgie, Vol. LIII, Parts 3 and 4.

[3] Seven of Kümmel's cases and one of Quénu's are included in Bull's statistics.

[4] Bull. et Mem. de la Société de Chirurgie de Paris, Vol. XVIII, p. 397.

The prognosis after the supervention of the symptoms of peritonitis will vary according as the surgeon is permitted to interfere while the inflammation of the peritoneum is circumscribed or local on the one hand, or general on the other. With a strictly localized peritonitis, even though this enclose a considerable effusion which has undergone suppuration (encysted intraperitoneal focus of suppuration), the surgeon still has much in his favor, provided no unfortunate error in the technique permits the septic material to contaminate the peritoneal cavity. The same may be said of appendical abscess. General peritonitis, without the occurrence of suppurative changes in its resultant serous affusion, may likewise permit a favorable termination. Even if suppurative changes have occurred in an effusion which is located in the general peritoneal cavity the case is not deemed necessarily hopeless by some surgeons, although the chances of recovery diminish progressively with the lapse of time since the infection of the fluid. The number of cases which recover under these circumstances must be exceedingly small as compared to those that perish. The effused serum forms a culture medium favorable to the development of bacteria, and in a few hours it may be transformed from an innocent serous fluid to a virulent toxic material giving rise to a rapid and general infection, before the occurrence of any suppurative changes whatever.

Undoubtedly, under these circumstances, the operative procedure, while it gives the patient the only chance of recovery, tends to hasten the end in cases that prove fatal. The general vital resistance to infection is always lessened by the administration of an anæsthetic. It is not an infrequent occurrence to have patients develop the most pronounced general septic symptoms in cases where the condition of the peritoneal cavity is such as to cause surprise that the general symptoms were not more pronounced prior to the operation. What would have happened a few hours later is brought about by the anæsthetic and operative procedure. The justifiability of interference in many of these cases is not lessened by this possibility; the necessity for early interference is simply emphasized by it.

With an extravasation of pus, serum, or sero-purulent fluid

in connection with fæcal matter, revealed by the operative procedure, but one result can be expected. It is the rarest occurrence in all surgical practice to have a patient recover under these circumstances. A patient will occasionally leave the operating-room alive, if the surgeon is not too persistent in his efforts to cleanse the peritoneal cavity.

Certain untoward intra-peritoneal complications follow the operation in this as in other cases necessitating the opening of the abdominal cavity. These occur in about the same proportion as in laparotomies in general. They consist in intestinal obstruction due to intestinal paresis, ileus, or angulation. The intestinal obstruction due to intestinal ballooning is an almost necessary accompaniment of septic peritonitis; the prognosis after this condition is once fully established is very unfavorable. I do not remember ever to have seen a patient recover under these circumstances; certainly not after its occurrence in the course of septic peritonitis from appendicitis.

Ileus or angulation, or both, may be present before operation. The latter condition is of more frequent occurrence, and may be due to the manner in which the adhesions form about the ileo-cæcal valve. The gravity of the case will be necessarily increased by the occurrence of this accident.

The occurrence of angulation after the operation may be due to adhesions which form between the intestine and some adjoining serous surface that has either been abraded, or has been the site of a former adhesion, or a stump of ligated omentum. The last-named condition occurred in one of my cases.

The Treatment of Appendicitis.

While the physician is very generally first summoned to a patient suffering from appendicitis, the responsibility of the treatment should be shared both by the physician and by the surgeon. The great majority of cases should be treated surgically. Beyond the careful use of salines in the very commencement of the disease, and this only if the symptoms denote a mild type of the affection, the less medical treatment which cases of appendicitis receive the better. Above all things the use of opium must be

avoided as much as possible. Its use masks the progressive character of some of the most important symptoms; with free use of the drug the patient's condition seemingly improves, but a sudden increase of pain, followed by distention of the abdomen, accompanied or followed by a rapid pulse and some rise of temperature, announce the occurrence of septic peritonitis. It should not be forgotten that an exceptionally virulent infection may produce septic peritonitis with neither primary perforation of the appendix into the peritoneal cavity nor rupture of an abscess cavity; delay in operative interference in such cases will certainly result in disaster, and interference may fail to save the patient.

The indications for operative interference during an attack of appendicitis may be summed up in a few words: As soon as the diagnosis of progressive appendicitis is assured, the abdominal cavity should be opened and the appendix removed. If opium has been injudiciously administered, and the progressive character of the case in hand is doubtful, it is better to err upon the side of safety, and remove the appendix at once. The conditions present are usually beyond the power of nature to remedy, while, in the hands of a surgeon who pays strict attention to aseptic details of the operation, the latter entails less risk to life than that which is involved in even a mild attack of appendicitis which remains stationary at the end of twenty-four hours, with all its possibilities of lymphangitis, infection of the peritoneal cavity, retained muco-pus within the tube, and rupture of the latter into an unprotected peritoneal cavity; or ulceration and perforation either from the presence of so-called coproliths or inspissated fæcal matter imprisoned by constriction within the cavity of the appendix, or from gangrenous conditions alone.

In formulating a definite rule for action in the operative treatment of appendicitis many difficulties are met with. To operate too early may be to operate unnecessarily, but this is always preferable to operating too late and hence unsuccessfully. The fact that operative procedures are quite safely performed where a distinctly outlined and encapsulated abscess cavity is present, provided the surgeon does not disturb its wall, has led

Reclus and Schmit, of Versailles,[1] to adopt this period as the stage of election. These surgeons content themselves with simply emptying the pus-cavity. On the other hand, many surgeons advocate operation as soon as the diagnosis of appendicitis is made, whatever its grade of severity. A case demanding operation inside of twenty-four hours from the commencement of the attack is exceptional; but a case which is not practically well at the end of that time should be made the subject of operative interference. The surgeon, however, should by no means limit himself to that period. In cases in which unusually severe symptoms, such as high temperatures and a succession of rigors, are conjoined with exquisite tenderness in the right iliac fossa and an anxious facial expression, the surgeon should not hesitate to give the patient the benefit of an early and radical operation.

Where the patient is not seen by the surgeon until the third, fourth, or fifth day of the attack, the question as to whether or not the operative procedure may be contraindicated by the impossibility of removing the appendix without breaking down the adhesive barrier which has been thrown out is one which is frequently encountered by those engaged in this class of work. As very tersely stated by Richardson,[2] we may be confronted by cases which are in such a condition as to be too late for the early operation, and too early for a safe late operation. In deciding this question, much will depend upon the experience of the operator, and the facilities which he may possess in the shape of skilled assistance and other requisites to meet all emergencies as they arise. With a thoroughly trained first assistant to stand opposite to the operator, and who with thick gauze compresses, wet with a $\frac{1}{1000}$ sublimate solution, is able to keep the field of operation well isolated from the rest of the peritoneal cavity, as well as the small intestines out of the way, the operation at this the period of localized peritonitis, with or without encysted seropurulent collections, is both safe and advisable. It will be almost next to impossible to avoid breaking down some of the adhesions,

[1] Discussion upon appendicitis before the Surgical Society of Paris. Bull. et Mem. de la Société de Chirurgie de Paris, Vol. XVIII.

[2] The American Journal of the Medical Sciences, January, 1894, page 13.

but with care on the part of the operator and a perfectly trustworthy assistant, removal of the appendix may be accomplished without undue risk of infecting the general peritoneal cavity, even under these circumstances, particularly where the collection lies dextral to the ascending colon.

In some cases it may be possible to remove that portion of the appendix which is the seat of ulceration, perforation, or gangrene without being able to safely isolate and excise the remainder. Under these circumstances the portion accessible may be ligated and removed, the patient being advised to submit to a subsequent operation for the removal of that which must, in the patient's best interests, be necessarily left.

If the surgeon is called in after peritonitis has developed, operative measures may still be instituted, although the chances of recovery under these circumstances are relatively small. Infection of effused serum following peritonitis, not necessarily suppurative, offers just sufficiently encouraging results to impel the surgeon to offer the patient the benefit of a late interference. The case is almost necessarily hopeless after general suppurative peritonitis has commenced; the chances of recovery progressively diminish with the lapse of time following the beginning of the peritonitis.

If the septic peritonitis is due to the rupture into the peritoneal cavity of one or more of the minute embolic abscesses which sometimes form in the wall of the appendix in the course of a suppurative inflammation of the walls of the organ, an operative procedure may still be undertaken, provided the serous effusion is not large nor present sufficiently long to give rise to septicæmia.

If the entire contents of an abscess cavity, or of an intraperitoneal encysted serous effusion which has undergone suppurative changes, have been discharged into the cavity of the peritoneum, the surgeon will be confronted by a condition of affairs which may well cause him to hesitate. In such cases it is advised by some to flush out the peritoneal cavity with sterilized water, or with an artificial plasma, with the view of ridding the patient of the source of the general infection which almost neces-

sarily comes on under such circumstances. The operator, however, will be guided to a great extent by the condition of the patient. In my own experience I have never seen this procedure result in benefit when attempted; usually the patient's condition was such as to impel me to abstain from the effort, or to very quickly abandon it. It is usually impossible to follow the septic fluid, pus and fæcal matter in those cases in which the appendix sloughs away from the cæcum, and leaves a perforation communicating directly with the intestinal tract. The operator will be compelled, as a rule, to content himself with cleansing that portion of the peritoneal cavity which can readily be reached, and afford drainage by means of antiseptic gauze.

Certain cases may require a lumbar incision; those, for instance, which have resulted in a lumbar phlegmon. Here the indications are clear: The area of suppuration should be freely incised, and access afforded to its deepest point. The question of draining localized sero-purulent collections through the rectum or through the vagina rather than through the otherwise unaffected peritoneal cavity, is one requiring careful consideration. The difficulties experienced when either of these routes are chosen introduce dangers into the case which outweigh those following the adoption of the intra-peritoneal route. I am not prepared to say, however, that I would decline to adopt such a course as that above indicated, in an individual case, in which a fluctuating tumor could be plainly made out from the direction of one of the cavities mentioned, and in which it was sufficiently certain that the intervening structures were so matted together by the inflammatory process as to afford a reasonable guarantee against connective-tissue extravasation or infection, or both, by means of the contents of the abscess. In other words, unless the latter is clearly pointing in one or another of the directions last mentioned, drainage by one of these routes is unsatisfactory, to say the least, and not to be chosen.

In those instances in which the presence of a true appendical abscess can be made out, the purulent collection having taken place in the post-peritoneal connective tissue, and bounded anteriorly by the transversalis fascia and posteriorly by the iliac

fascia, the abscess cavity may be reached by a horizontal or an oblique incision placed to the outer side of the epigastric artery. The skin, superficial fascia, aponeurosis of the external oblique, the transversalis muscle and transversalis fascia are successively divided. By this means the focus of suppuration is reached without incising the peritoneum.

The operation chosen should be carried out with the most rigid attention to aseptic surroundings and conditions, even though infection of the peritoneal cavity is known to have already taken place, or though suppuration be present. There can be no excuse for any failure in the aseptic technique, even under such circumstances. Unless asepsis can be satisfactorily secured at

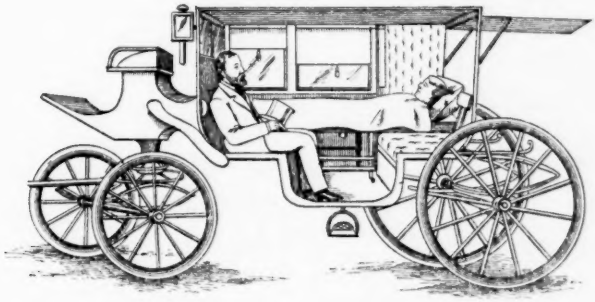

FIG. 1.—Invalid coach designed by Dr. MacNaughton. The side of the coach is represented as having been removed, in order to show the arrangement of the interior.

the patient's home, it will be better to transfer him to some hospital well equipped for the work than to attempt any make-shifts. With the invalid's coach, devised by Dr. MacNaughton, this can be accomplished in a perfectly safe and satisfactory manner. (Figs. 1 and 2.)

The Trendelenburg position (the elevated pelvis position) is best adapted for the removal of the appendix, provided no septic fluid surrounds the latter. In case an encysted sero-purulent deposit or an appendicular abscess is present, this position has the disadvantage of facilitating the passage of the pus to the upper portion of the peritoneal cavity, and at the same time of preventing the rapid turning of the patient upon his right side in

order to obtain the assistance of gravity in preventing the infection of the peritoneal cavity. For operations performed between the attacks, as well as during the first few hours of an attack, it is greatly to be preferred.

The dorsal position should be first employed in all doubtful cases which are operated upon in the uncertain intermediate stage. If it is found upon reaching the appendix that neither sero-purulent nor purulent material is present, the patient may be brought to the Trendelenburg position for the remainder of the procedure. This may be readily accomplished if a proper table is employed, which permits an easy and rapid change from one position to another. In order to facilitate the turning of the patient to either side, and at the same time to enable the operator

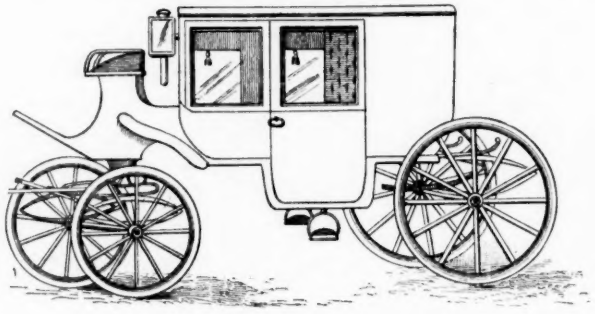

FIG. 2.—Coach closed and ready for the transportation of the patient.

to obtain the advantages of the Trendelenburg position when this can be employed, I have had a table constructed, shown in Figs. 3, 4, 5 and 6. A reference to the cuts will explain its mechanism without further description. If a tumor is felt, it is fair to assume that septic fluid is present, and the dorsal position must be used, with facilities for turning the patient over on the right side at a moment's warning.

The position and direction of the incision are to be selected in accordance with the conditions present and the purpose of the operator. If the case is one in which the surgeon will probably undertake to remove the appendix, the vertical incision, passing along the dextral edge of the right rectus muscle, may be chosen.

(Fig. 7.) If a tumor be present, and the object of the operator is simply to evacuate an abscess, an incision, following the general direction of the fibres of the external oblique muscle over the most prominent portion of the tumor, will be better. In case the diagnosis is doubtful, and the operation is, to a great extent, an exploratory one, the median incision is to be selected. Another method of gaining access to the parts, which I have latterly employed in both classes of cases, is through the oblique incision. (Fig. 8.)

The vertical incision gives the best access to the underlying parts, and permits a ready exploration, as well as ease of ex-

FIG. 3.—Operating table, with steam or hot-water coil attachment for heating. The bed of the table swings upon trunnions at either end, and is secured in position by a simple device.

cision of the appendix. A disadvantage of its employment, however, consists in the frequency with which the operator injures the efferent branches of the deep epigastric vein, which accompanies the artery within the sheath of the right rectus muscle. The artery can easily be avoided, but the veins that empty into the epigastric vein or veins, for there are sometimes two, are quite large, and pass almost at right angles to the incision. Again, in suturing the wound, if the sutures are properly placed, and include the muscular structure, the trunk of the vein may be punctured by the needle. This is sometimes the cause of vexatious delay during the completion of the operation.

The oblique incision is not open to the above objection, but its employment necessitates somewhat more retraction of the inner edge of the incision if the caput coli does not come readily into view. This disadvantage can be overcome by the aid of a competent assistant, although where there is much tension of the abdominal muscles it keeps both his hands constantly in use for this purpose. While abdominal retractors have their proper sphere, there is nothing that can compare in this operation with the fingers of an intelligent co-worker.

To facilitate the search for the collection of sero-purulent matter or pus which, when intra-peritoneal, in the majority of

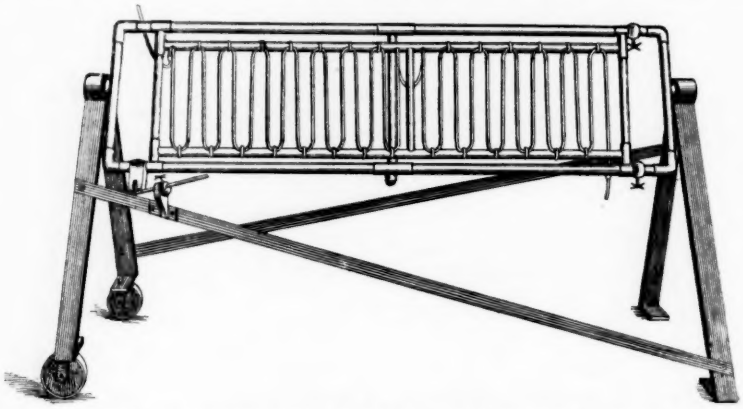

FIG. 4.—Operating table tilted to one side to facilitate emptying of an abscess cavity or an encysted intra-peritoneal sero-purulent collection.

cases is to be sought between the caput coli and the lateral pelvic wall, an additional incision may be made extending from the middle of the oblique incision downward and outward at right angles to the former. (B, Fig. 8.) To facilitate exploration in an upward and inward direction an additional incision may be made from the cephalic limit of the oblique incision, in a direction upward and inward to the dextral edge of the right rectus muscle. (C, Fig. 8.) These two additional incisions, while they will cross the fibres of the external oblique muscle, will run parallel with the fibres of the internal oblique muscle. The additional incision first described, which extends from the middle

of the oblique incision towards the anterior superior spinous process of the ilium, has the advantage of facilitating drainage in certain cases, and of permitting of suturing of the entire incision exclusive of this. Subsequent ventral hernia is avoided in those cases in which it is most apt to occur, namely, suppurating cases in which the abdominal wound cannot at once be closed. This portion of the oblique "T" incision, even if it unites only by secondary intention, is the least likely to give rise to ventral hernia of any of the incisions in the abdominal wall that are employed in appendicitis cases.

As the incision deepens over the seat of the disease, if the

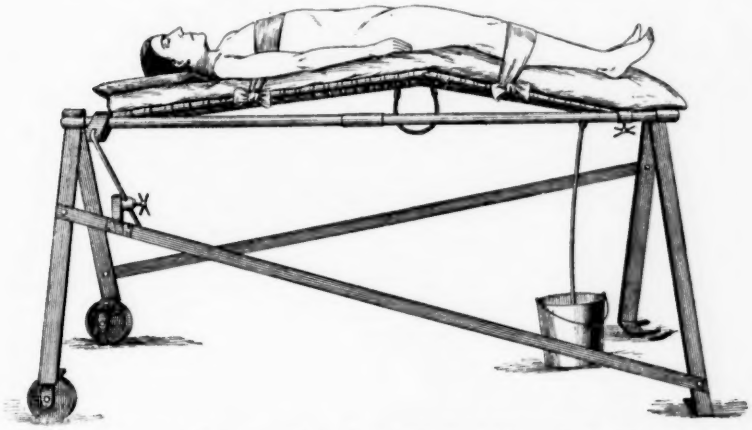

FIG. 5.—Showing patient secured to the table ready for tilting to one side. The slight elevation of the bed of the table brings the field of operation in a conveniently prominent position.

latter is ventrally placed and advanced to the stage of suppuration, some œdema of the abdominal wall, with or without matting together of its separate structures, will be observed. Where no suppuration is present, or where it is deeply placed dorsally or in the pelvis, this will not be seen. When present it will serve as a guide to any adhesions between the peri-appendicular structures and the abdominal wall, and will sometimes enable the operator to reach the interior of a sero-purulent or purulent collection without invading the peritoneal cavity at this stage of the operation.

If no adhesions exist ventrally, the operator proceeds at once to expose the cæcum by making any necessary addition to his original cut. Abdominal compresses, made of six or eight thicknesses of cheese-cloth, eight inches square, hemmed at the edges to prevent fraying, and wet with a $\frac{1}{1000}$ solution of mercuric chlorid, are now introduced as far as possible upon all sides of the exposed diseased area in order to thoroughly isolate the remainder of the peritoneal cavity from the primary focus of infection. Everything is now in readiness to turn the patient over upon his right side at a second's warning. Adhesions are now gently parted, always commencing with those between the

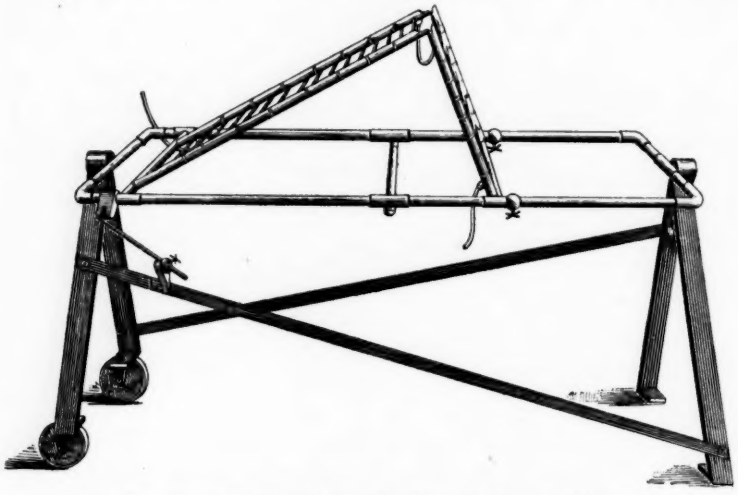

FIG. 6.—Operating table in the Trendelenburg position.

pelvic wall and the outer surface of the colon, if any exist at this point. The site of the disease is thus sought. Immediately upon the appearance of any sero-purulent material this is gently but rapidly wiped away, if small in amount; the patient is turned upon his right side, if the quantity be large, and there supported, while the fluid which flows out is gently washed away. The finger is now carefully introduced at the point between the adhesions from which the fluid made its first appearance, and further egress given to the latter. At the same time the operator ascertains whether the parts in the neighborhood are well walled

off from the peritoneal cavity. If this is assured, he may venture to wash out the cavity directly with a gentle stream from the irrigating apparatus. For purposes of irrigation either Thiersch's boro-salicylic solution or a freshly-prepared solution of sodium chlorid, or of the normal salts of the blood in sterilized water may be employed at this stage of the operation. Plain sterilized water will answer the purpose. When an abscess cavity is to be disinfected, however, a $\frac{1}{2000}$ solution of mercuric chlorid is to be used. This in its turn is to be washed away with one of the solutions just named. During the time that the patient is turned upon his side it is of the greatest im-

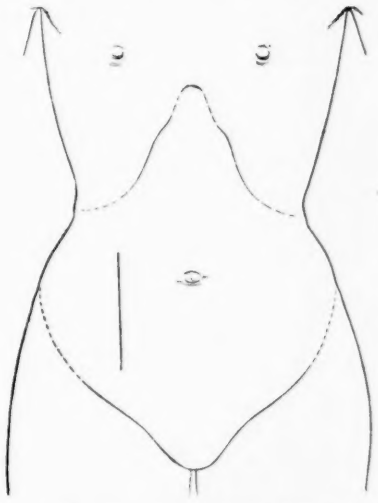

FIG. 7.—The vertical incision.

portance that the first assistant attend strictly to the task of retracting with his hands the edges of the abdominal wound and of keeping the remainder of the peritoneal cavity isolated, as well as adjacent coils of intestine, when adhesions have been broken down, from falling into the septic area, by means of large and thick gauze compresses.

After the purulent material has ceased to flow, and the parts have been cleansed as well as the position will allow, the patient is replaced in the dorsal position, and the search for the

appendix is continued. The Trendelenburg position may now be employed to facilitate this stage of the operation, as well as to relieve the principal assistant. Watchfulness must be exercised for other sero-purulent deposits, and everything made ready for the right lateral position, should necessity demand it. Personally, I never feel perfectly comfortable with the patient in the Trendelenburg position, except in those cases in which I am operating very early in the disease, before any intra-peritoneal foci of suppuration are present, or very late, when an appendicular

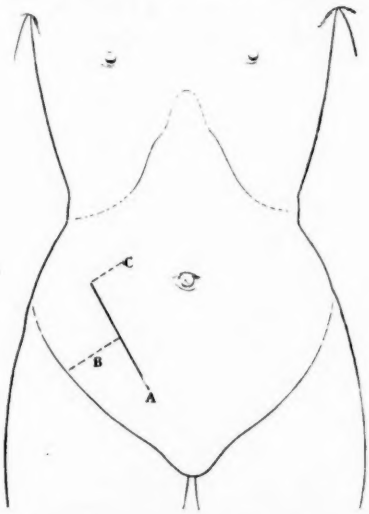

FIG. 8.—A, the oblique incision. The longer dotted line, B, employed for the purpose of facilitating drainage in cases in which it is deemed advisable to close the oblique incision, converts this into the oblique T incision. The shorter dotted line, C, is sometimes useful when further exploration is found necessary.

abscess exists. These latter are usually single, are walled off by strong adhesions, and present and empty themselves promptly upon opening the peritoneal cavity, after which the elevated pelvis (Trendelenburg's position) offers many advantages.

If the vermiform appendix does not come readily into view, or within reach of the operator, search for its site may be further facilitated by identifying the location of the cæcum. This is done by means of the pouched appearance of the latter organ,

as well as by the presence of the three flat, longitudinal, muscular bands, each about half an inch in width, which commence at the attachment of the appendix to the cæcum. The ventral band, the largest of the three, will usually come into view, unless shut off by adhesions; the dorsal band is placed along the attached border of the intestine. The identification of either of these bands will serve as a guide to the appendix. The third or lateral band is placed upon the sinistral side of the ascending colon, and if adhesions are present, will not be available in the search.

As the adhesions are parted the appendix is identified. This will be found to be of a somewhat solid consistency, feeling not unlike a slightly flexed little finger. It is to be carefully freed from its surroundings by the finger of the operator, very much in the manner in which the Fallopian tube is isolated in the operation for pyosalpinx.

In the attempt to isolate the appendix the surgeon must not lose sight of the fact that he may do more harm than good if the organ is so placed as to form a portion of the protecting wall of adhesions; particularly if its position prove to be on the lines N. E., E. or S. E. On the other hand its isolation and removal from the positions S., S. W., W., N. W. and N. will generally be found practicable and safe. If symptoms of intestinal obstruction have been present in the case, it will be best, even with the additional risk, to break up all adhesions with the view of relieving the obstruction, first being assured that thorough disinfection of the primary focus of sepsis has been accomplished.

The manner of dealing with the appendix will vary with the character of the case. In some instances its condition will not admit of any choice. Simple ligature, by means of chromicized catgut at its base, or as near thereto as possible, the mesentery being included in a separate ligature, whenever practicable, and amputation of the organ, the mucous membrane being destroyed by means of the thermo-cautery or fuming nitric acid, is deemed quite sufficient by some surgeons. Indeed, it happens only too frequently that the exigencies of the case will only permit of this method, as in cases in which abscess or a sero-purulent fluid is present, and it is found impossible to gain room for the applica-

tion of a typical procedure without running the risk of breaking down limiting adhesions. The wall of the appendix, if in a gangrenous condition, will sometimes scarcely hold a ligature, much less permit of the application of a series of sutures in closing over the stump in some of the methods proposed. The application of a pair of clamp forceps or hæmostats to the site of the base of the appendix must suffice in some instances. Even the adjoining wall of the cæcum itself is frequently softened by inflammatory processes, and will not hold a suture. Again, the patient's condition will not admit of the delay necessary in these niceties of technique in many of the cases which fall into the surgeon's hands.

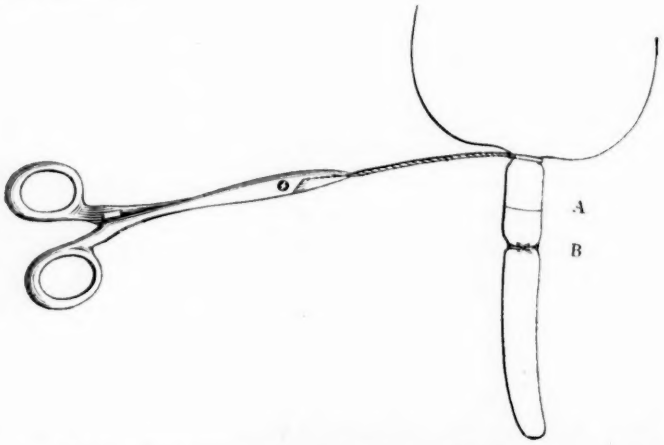

FIG. 9.—Temporary constricting ligature in position. A, Line of circular incision; B, second ligature applied to the appendix to prevent escape of its contents when the final amputation is accomplished.

Where a rapid completion of the operation is not demanded, and the condition of the parts will permit of it, the method which I have employed with very great satisfaction is that of the circular flap amputation. The employment of this procedure is almost entirely limited to cases of the recurrent and chronic relapsing varieties of the disease operated upon in intervals between the attacks. It is carried out as follows:

A temporary ligature is thrown around the base of the appendix close to the cæcum. (Fig. 9.) This is not tied, but

simply twisted until it constricts the organ sufficiently to prevent the escape of fæcal matter from the cæcum should the cavity of the appendix be accidentally invaded before the application of the final and permanent ligature. This temporary ligature should be sufficiently long to be grasped by a pair of clamp-forceps at its extremity, which will aid in the twisting; at the same time it will, by its weight when dropped outside the wound in the abdominal wall, prevent the untwisting of the ligature. A second ligature is applied and tied about the appendix at a point half an inch distal of the first ligature. (B, Fig. 9.)

A circular incision is now made, either by means of a sharp scalpel, or preferably by snipping with the points of the scissors, in the space between the two ligatures. (A, Fig. 9.) This

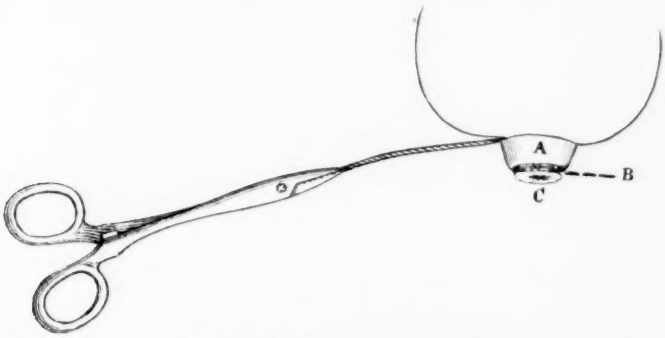

FIG. 10.—A, Cuff-shaped flap of serosa and subserous connective tissue; B, permanent ligature of the muscular wall and mucous lining of the appendix; C, mucous membrane remaining in stump.

should include the serosa and the subserous connective tissue. A cuff-shaped flap, (A, Fig. 10) formed of these structures, is turned back toward the temporary ligature until the latter is reached, precisely as the cuff-shaped flap in a circular amputation of the arm is turned back to uncover the underlying structures. A ligature of fine, ordinary catgut is now placed around the wall of the appendix at the bottom of and within the reflected cuff of serosa, and as nearly upon the same level as the temporary constricting ligature as possible. (B, Fig. 10.) The catgut ligature, here employed, should not be chromicized, but prepared without any hardening process; boiling in alcohol accom-

plishes the purposes of sterilization without materially altering the other qualities of the gut. This ligature is tied tightly and cut off close to the knot. Its purpose is to prevent hæmorrhage from the cut surface of the wall of the appendix, as the latter is cut away, and to shut off the cavity of the cæcum when the temporary constricting ligature is removed. The appendix is now amputated and the mucous membrane remaining in the stump (C, Fig. 10) touched with the thermo-cautery or

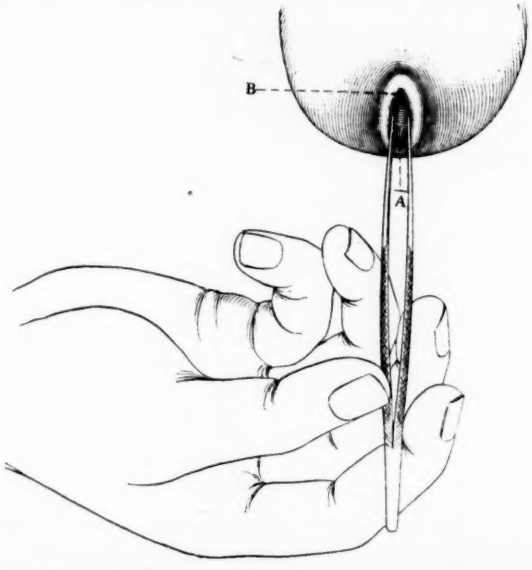

FIG. 11.—A, Stump of appendix, grasped with a pair of forceps and crowded into the wall of the cæcum; B, furrow in which the stump is burned.

fuming nitric acid. The best method of applying the nitric acid is by means of an inverted Hagedorn needle grasped in the jaws of a hæmostic forceps. The large eye of the needle holds just sufficient of the acid for the purpose, and by carrying the proper amount, and no more, to the point needed insures against bringing the parts adjacent to the stump in contact with the acid. The cuff-shaped flap is now placed over the face of the stump and the latter is grasped by means of a pair of dissecting forceps, and crowded against the wall of the cæcum

in such a manner as to form a furrow or depression in the latter (Fig. 11); the edges of the latter are sutured together over the stump of the appendix by means of a double row of Lembert sutures, so as to bury the latter out of sight (Fig. 12).

In the course of two or three days the ligature about the wall of the appendix, and which has been buried into the furrow with the stump of the latter, gives way. In the meanwhile the sutured edges of the furrow have become strongly adherent, and there is no longer danger of escape of the contents of the cæcum. This loosening of the ligature permits a smoothing out of the little dimple which took place upon the mucous membrane side of the cæcum at the site of the former communication of the latter with the appendix, upon the application of the ligature. Finally, cicatrization at this point, conjoined with the thickening of the cæcal wall resulting from the suturing together of the

FIG. 12.—Furrow in the wall of the cæcum sutured over the stump of the appendix.

edges of the furrow upon the peritoneal surface, leads to a firm and solid condition of the intestinal tube at this point.

In cases in which the wall of the appendix is in a sufficiently good condition to bear the application of a ligature, and yet the surrounding structures, or the exigencies of the case from some other standpoint, will not permit of the manipulation necessary to carry out the above procedure, a ligature may be thrown about the organ at its base, including its serous surface, the organ amputated distad of this, the pouting portion of mucous membrane in the stump destroyed by the thermo-cautery or nitric acid, and the stump itself sunk into the furrow upon the peritoneal surface of the cæcal wall, as just described. In the majority of cases operated upon during the active existence of the disease, this method of dealing with the appendix will constitute as near

an approach to the typical procedure as it will be possible to accomplish. Its employment will therefore be more frequent than that of any other.

The meso-appendix should, as a rule, be dealt with separately. It will sometimes be found practicable to bring the stump of the mesentery over against the site of the stump of the appendix so that its raw surface is applied to the raw surface of the latter, thus doing away with the necessity of burying this in a furrow of the cæcal wall.

This latter is a useful procedure, particularly in those cases in which a typical method like that above described cannot be carried out. In any event it insures a firm covering and more solid protection to the weakened wall of the cæcum at the point from which the appendix has been removed, and, what is also of very great importance, by this method of technique the leaving of raw surfaces of peritoneum is avoided, and the formation of vicious adhesions leading to angulation of intestine, and subsequent obstruction prevented.

If the base of the appendix is unusually broad, as in the fœtal type, the appendix, together with a portion of the wall of the cæcum, if practicable, should be excised, the edges of the opening being afterwards approximated, and a double row of Lembert sutures applied. Where the cæcum is sufficiently free from adhesions to permit of its being brought outside of the peritoneal cavity, thus avoiding the risk of infecting the peritoneum by means of its contents, the latter procedure may be found an exceedingly useful one, even in cases of simple appendicectomy, the ordinary type of the organ being present.

If it is decided not to remove the appendix, its surroundings may be carefully disinfected with a 10-per-cent. solution of chloride of zinc, and the abscess cavity lightly tamponed with Mikulicz's wick-drains, or drains made of iodoform or zinc oxide gauze.

The strips of gauze used for tamponing should have their edges folded in as follows: a strip of the material is taken and smoothed out; each edge of this is now turned in in such a manner that both edges will meet in the middle; the strip is again folded, bringing the two doubled margins together; a running

thread holds these folds in position; these strips are placed in position in an antero-posterior direction as regards the patient's body (anatomically speaking), and the strips systematically arranged in successive layers or folds, so as to effectually shut off the remainder of the peritoneal cavity, as well as to facilitate the removal of the gauze. My plan is to take a portion of the gauze strip and lay it in folds, the one upon the other, so as to make a drain sufficiently long for the purpose. This is placed in position in such a manner that when removed layer by layer, those layers which are farthest removed from the peritoneal cavity, and hence the nearest to the abscess cavity, are removed first. A number of these are sometimes required. The outer ends of the strips of gauze should be brought out of the most dependent portion of the external wound. The primary incision should be closed as much as possible, consistent with free drainage and the easy removal of the gauze tampons. The advantage of the T-incision under these circumstances will be very great.

If the appendix is so situated as to admit of removal, the question must be decided whether it is best to close the wound entirely, or whether it shall be partially closed and the cavity tamponed. In coming to a decision, the extent of the infection, the completeness with which the cavity can be disinfected, and the size of the cavity are the chief considerations to be taken into account. Provisional sutures, designed to serve as secondary sutures, are placed in position, and left loose ready for tying when the proper time arrives. These provisional sutures are to be placed throughout the entire extent of the wound not closed at once.

The method of suturing and the material employed are of some importance. The "crossed suture," an account of which I have already published,[1] is designed to secure coaptation of the separate structures represented in the edges of the incision. Corresponding parts are included in the individual loops of the same suture, thus doing away with the necessity of leaving buried sutures *in situ* (Fig. 13). The material used may be

[1] ANNALS OF SURGERY, Vol. XV, No. 5, May, 1892, p. 351.

silkworm-gut, horse-hair, or Chinese silk; the first named being preferable.

The outer dressings employed are such as are used after abdominal operations in general. The indications for redressing the depths of the wound cavity in cases which are simply tamponed are as follows:

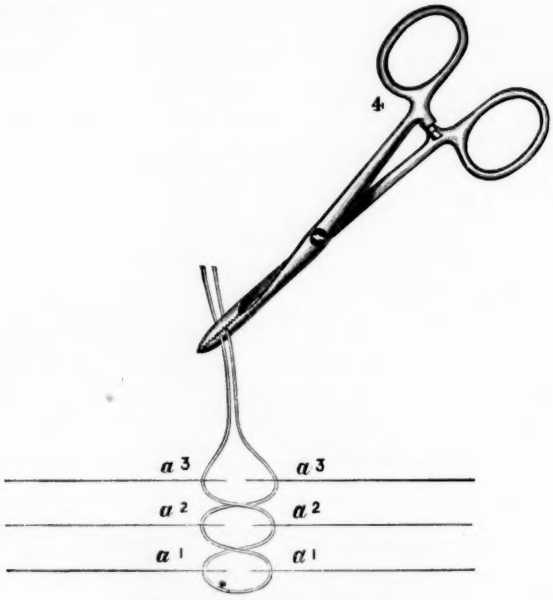

FIG. 13.—The crossed suture.

a^1, Line representing the peritoneum.

a^2, Line representing the muscular and fascial layers.

a^3, Line representing the integumentary layer.

4, Hæmostatic forceps temporarily securing suture for ready dentification until all are ready for tying.

All three layers are shown included in the loops of the crossed suture, ready for tying.

In those cases in which adhesions are broken down, and the general cavity of the peritoneum opened, the gauze packing which isolates the stump of the appendix and the site of the formerly existing purulent collection from the peritoneal cavity should be left undisturbed for several days, until protective adhesions have formed beyond the gauze.

Where the abdominal wound is entirely closed at the time

of the operation the dressings need not be removed until ten days or a fortnight have elapsed, at the end of which time the sutures may be removed. Exceptions may be found to this rule, in instances in which stitch-abscesses occur.

Where the wound is partially closed and provisional sutures are placed in position the latter may be drawn taut, so as to close the wound as soon as the septic conditions have passed away and healthy granulations make their appearance. A small opening may be left at the lower angle of the incision for drainage if a cavity is found to exist beneath the surface following the tightening and tying of the provisional sutures. If no provisional sutures have been placed in position, secondary suturing of the wound should be done as soon as it is in proper condition for the same. The drawing together of the unclosed portion of the wound by means of previously-applied provisional sutures, or the application of secondary sutures, at as early a day as possible, will tend to insure the patient against the occurrence of ventral hernia as a sequel to the operative procedures.

In order to facilitate the removal of the gauze strips in cases in which it is found necessary to employ these, and to disturb the parts as little as possible while this is being done, it is best to remove the strips in the reverse order from that in which they were placed in position. In order to accomplish this with certainty the strips are numbered with India ink when they are made, and then used in regular order, or else they may be knotted as they are used, the number of knots serving to identify them.

If the exigencies of the case and the character of the attack have permitted it, the patient's bowels will have been thoroughly moved before the operation as a part of the routine of the preparatory treatment. Saline cathartics are best for this purpose. With or without this preliminary treatment the surgeon will always feel easier when his efforts to secure a number of fluid movements by the use of saline cathartics have been successful. In those cases in which typical suture or ligature of the appendix has been impracticable, or in which the removal of the organ is not deemed safe, fæcal extravasation, either from an insufficiently-

secured stump or from a perforated appendix, is to be feared, and measures taken to prevent a fluid condition of the intestinal contents for several days. The lower bowel may be cleared out by means of simple enemata, however, with advantage, even in these cases. Where early movements are permissible or indicated the longer this is postponed the greater are the chances of the occurrence of those dreaded conditions, septic peritonitis and intestinal paresis. In these latter cases, therefore, as soon as the stomach of the patient will bear it, a half-ounce dose of sulphate of magnesium dissolved in Vichy water should be given. This is to be followed by drachm doses, given hourly, until the bowels act thoroughly. By this means the peritoneal cavity is effectually drained; the serous effusion finds its way into the intestinal canal by means of endosmosis, as the latter is emptied of its contents.

Of late it has been my habit to wash out the patient's stomach while he is still under the anæsthetic, immediately placing therein an ounce or more of a saturated solution of sulphate of magnesium when the use of this is indicated. The advantages of this procedure consist, first, in getting rid of a considerable amount of mucus, more or less loaded with ether or chloroform, which has found its way into the patient's stomach during the administration of the anæsthetic, whereby the after-vomiting is very much lessened, and, second, in insuring the retention of at least this first dose of the saline, when this is administered in addition.

The after-treatment, exclusive of the precautions alluded to, is that of laparotomies in general; early (when indicated) and free purgation, by means of salines when these are well borne by the stomach; the use of small doses of calomel, followed by a pill of extract of colocynth, extract of jalap, and podophyllin, when the stomach will not bear the salts; drachm doses of hot water, half hourly, during the first twenty-four hours, this to be followed after that time by half-ounce allowances of peptonized milk, gradually increased to full milk diet in the course of the following two or three days; then farinaceous food and meat, gradually leading up to full diet. If the patient's condition

require them, nutrient or stimulating enemata may be administered. Pain is to be controlled by hypodermatic injections of morphia.

Most of the post-operative complications are such as are met with in other abdominal operations. Excessive vomiting may be relieved by lavage, using a solution of boracic acid (℥iij to Oj). While the stomach tube is still in position, a dose of Epsom salts may be given if the use of this is still indicated and it has not been previously retained in the stomach. The administration of a quarter of a grain of cocaine dissolved in water and given five minutes before the salts are to be given will frequently enable the latter to be retained.

The occurrence of peritonitis demands prompt action. It is impossible to lay down any hard and fast rule in the treatment of this complication. Free drainage through the intestinal canal offers the best chance to the patient; how difficult this is to accomplish those know only too well who have had much to do with this condition. The ice coil, although its curative properties may have been greatly overestimated, should be employed on account of its tendency to relieve pain, if for no other reason. As a rule, its use greatly increases the comfort of the patient.

With the development of intestinal paresis increased difficulty in effecting movements of the bowels is experienced. Small doses of calomel in conjunction with, or alternating with, the sulphate of magnesia are sometimes useful. In connection with this, strychnia is given, hypodermatically, in 1-20 grain doses, hourly, or even half-hourly, in extreme cases. Faradization, one pole being placed in the rectum, and the other spread over the abdominal surface or stroked along the course of the large intestine, has been of use in my hands. Half-hourly séances of ten minutes each are sufficiently frequent. The condition, however, is a symptom of a general septic peritonitis, which will, in all probability, prove fatal, if the intestinal paralysis becomes complete. A general abdominal and pelvic septic peritonitis is, in my experience, an invariably mortal affection. Without exception, complete intestinal paralysis, occurring in connection with peritonitis, is the forerunner of a fatal issue.

The occurrence of septic peritonitis is usually postponed for from twenty-four to forty-eight hours, following the operation, more frequently the latter. If septic peritonitis is already present at the time of the operation, this interval, of course, will not be observed. The supervention of septic symptoms is exceedingly insidious. A gradual increase in the pulse rate, and slow, but persistent rise of temperature, particularly if these are conjoined with an obstinately constipated condition of the bowels, should always arouse suspicion. If vomiting sets in, both nourishment and medicines being rejected, and this be sufficiently removed, say by six or eight hours, from the vomiting resulting from the anæsthetic, and, in spite of all efforts to move the bowels no indications of passage of flatus, from one portion of the tube to another, are obtained upon auscultation of the abdomen, the case is a hopeless one. From this time on the course of the case will be typical, as a rule. The stomach rejects everything placed in it. The accumulation of gas and some of the fluids swallowed by the patient leads to progressive and excessive distention of the abdomen. Cold, creeping sensations and profuse perspiration set in. The surface of the body is bathed in a cold, clammy sweat. Attempts to sustain the patient, by means of stimulating and nourishing enemata, prove futile for the reason that these are promptly rejected. Jactitation now comes on; the peculiar muscular pains of sepsis cause the patient to become very restless, and this, conjoined with delirium, may necessitate extra watchfulness to restrain him from springing from the bed. The vomited matter becomes dark brown. The anxious expression of the face gives place to one of apathy or absolute hopelessness. The temperature may rise to from 105° to 107° F., the pulse becomes too rapid to count, or it may be absent at the wrist altogether. The finger-nails become blue, the skin is a dark, muddy hue; moisture exudes apparently from every outlet upon the surface.

Prior to the manifestation of the trouble every endeavor must be made to obtain a response to the salines or other cathartics administered. If within the first twenty-four or forty-eight hours these endeavors have been successful, the surgeon's mind will be comparatively easy; if unsuccessful, as already stated, the greatest anxiety must prevail.

In the treatment of this dreaded condition the ounce of prevention will outweigh many tons of cure. While the surgeon cannot be certain that anything is seriously wrong during the first twenty-four hours, the mere fact that the bowels do not move promptly will impel him to redouble his efforts in this direction until either these are successful or until it is evident that they are not likely to prove successful. If at the close of the second, or of the third twenty-four hours at the utmost, the patient's condition has shown no signs of a change for the better, all treatment should be abandoned, save that which is directed to euthanasia. In the meantime, and until it is evident that all efforts are useless, quinine in large doses, alcoholic stimulants, and strychnia should be given, either per rectum, if the latter will retain enemata, or hypodermatically.

I have never succeeded in ameliorating a patient's condition in the slightest by reopening the abdomen, under these circumstances, with the view of irrigation and drainage. It will usually happen that when the diagnosis is sufficiently assured to warrant this the case has advanced so far as to render the procedure useless, and perhaps harmful by tearing apart adhesions and exposing new surfaces to absorption. I have even gone so far as to institute and maintain continuous irrigation of the abdominal cavity, but with no effect other than to increase the distress of the patient.

If symptoms of mechanical intestinal obstruction develop, these should be met by a prompt reopening of the abdomen, and a search for, and a relief of, the imprisoned portion of the intestine. The obstruction is most frequently due to angulation, though ileus sometimes occurs.

The occurrence of vicious adhesions may lead to intestinal obstruction, at a period of time comparatively remote from the operation, and even after convalescence has been thoroughly established. The following case illustrates this condition:

M. C., aged fifteen, was operated upon for acute appendicitis in my service at St. Mary's Hospital. The appendix was removed, and the abdominal wound was closed, with the exception of about

an inch at the lower angle, where a small gauze drain emerged. The latter was dispensed with at the fourth dressing, and this portion of the wound rapidly healed by granulation. The portion of the wound that had been sutured united per primam. The patient was perfectly well, as far as the appendicitis was concerned, at the end of three weeks. Her mother gave her a banana to eat on the afternoon of the twenty-first day. After eating this she was seized with what appeared to be an attack of acute indigestion. During the night the abdomen became tympanitic, and vomiting occurred. This circumstance, together with the intractable character of the latter, and the failure to obtain a movement of the bowels, or even the passage of flatus by means of high enemata, demanded a second laparotomy. It was then discovered that a portion of the ileum had become attached by adhesions near the former site of the appendix. The adhesions were so placed as to bind down a loop of small intestine for a considerable distance toward the median line from the ileo-cæcal valve. The ballooning of the intestine by the accumulation of gas, resulting from the attack of indigestion, had produced a twist of a loop of intestine upon itself at its mesenteric attachment, thus causing both obstruction and rapid strangulation of the tissues of the intestine itself.

Fæcal communication between the cæcum and the wound-cavity may occur during the after-treatment. In one case in my hospital service, a communication between the wound-cavity and a coil of small intestine also occurred, but in this case tubercular ulceration was supposed to have been the cause. Fæcal communication usually has its origin in some condition of the vermiform appendix, which prevents the proper application of the ligature at its base. The occurrence of this accident in a case in which the abdominal cavity had been entirely closed would lead to fæcal extravasation and the most disastrous consequences. Its occurrence is usually limited, however, to the very class of cases in which entire closure of the abdominal wound is contra-indicated, namely, a septic condition of the appendix and the surrounding parts.

I have never known a fæcal communication of this kind to lead to a permanent fæcal fistula. With due attention to the cleanliness of the wound and encouraging healthy granulations,

together with care in securing frequent movements of the bowels by enemata (two or three times daily), all of the cases in my hands save one, in which this accident has happened, have terminated in complete closure of the fæcal communications before the final closure of the remainder of the wound itself. In the case mentioned, that of an elderly female, a plastic secondary operation became necessary. At the most, in the majority of cases, it will only delay for a time the application of the secondary sutures.

Mucous Sinus.—The occurrence of a mucous sinus has been met with occasionally. This results from a failure, either to completely cover the mucous membrane left in the stump of the ligated appendix, or to destroy it altogether. In my earlier operations I relied upon the application of pure carbolic acid to the stump, and in some of these a mucous sinus persisted; in one case this closed and opened several times. Permanent closure was finally effected after thorough curetting and the injection of equal parts of carbolic acid and tincture of iodine. Simple curetting, although thoroughly done on several previous occasions, had failed.

Ventral Hernia.—This has been observed in a certain proportion of cases to follow operations for appendicitis. The necessity for leaving open a portion of the abdominal wound probably gives rise to this most frequently. I have endeavored to prevent the occurrence of this complication by keeping the patient in the dorsal position for about six weeks in order to secure as much stability in the scar tissue as possible. In many cases in which the abdominal wound is closed at once, probably less than half of that time will suffice. Some form of abdominal support should subsequently be worn, particularly by those who are compelled to maintain the upright position during the entire day.

In cases where the abdominal wound is not closed immediately it will be subject to the same interruptions of the healing process as other wounds exposed to infectious influences. In the following case the healing process seems to have been complicated by the presence of a micro-organism to which, as found in man,

destructive pathogenetic properties have not heretofore been ascribed:

A. M., aged thirty-five, male, was admitted to my service at St. Mary's Hospital, with the history of having been attacked in the early hours of the morning of the previous day by all of the symptoms of appendicitis of an unusually severe character. A right lateral laparotomy revealed an appendix whose distal two-thirds was completely gangrenous. It was buried in a mass of adhesions which had also taken part in the gangrenous process. The appendix was ligated at the base, and excised. Unfortunately the circumstances surrounding the operation were such as to prevent a proper bacteriological examination. On the second day an elevation of temperature necessitated a re-dressing of the wound. It was found that the gangrenous process had extended from the cavity to the edge of the wound, and thence into the abdominal parietes towards the umbilicus, involving a space as large as the palm of the hand. The area of gangrene was marked by an irregular outline, numerous blebs, and considerable infiltration of the tissues. Stab inoculations in a sterilized agar-gelatine tube were made, and pure cultures of the *Bacillus pyocyaneus* of Gessards were obtained.

The technique of relapsing, as well as recurring cases, will not vary greatly from the foregoing. The Trendelenburg position can usually be employed, and the abdominal wound completely closed. The after-treatment will not materially differ from that pursued in any abdominal section in which complete closure of the wound is secured.

[TO BE CONTINUED.]

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, December 13, 1893.

ROBERT ABBE, M.D., President, in the Chair.

HALSTEAD'S METHOD FOR THE RADICAL CURE OF HERNIA.

Dr. CHARLES MCBURNEY presented a man who had been operated for the radical cure of an indirect inguinal hernia six weeks before, by Halstead's method, for the purpose of showing one or two things. First, that the cord had suffered no constriction at all. Second, that the existence of the cord outside the aponeurosis of the external oblique had given rise to no inconvenience or particular sensations. The vessels in the scrotum are not distended at all. The patient was kept in bed four weeks after the operation, union was primary, although the cord had been very freely handled, as it necessarily is in this operation.

Replying to an interrogatory by the president, whether he preferred that the patient wear a truss after this operation, Dr. McBurney said that he never put a truss on after an operation which he believed at the time would effect a cure. The pressure of a truss was unfavorable.

COMPOUND INTER-CONDYLOID FRACTURE OF THE HUMERUS.

Dr. F. W. MURRAY presented a man who was admitted to the New York Hospital on June 30 of this year, having been injured by falling a distance of fifteen feet from a scaffold, striking on the back of the left elbow. When first seen, twenty-four hours after the accident, the soft parts were greatly swollen and lacerated, and behind and to the inner side of the elbow was a wound where the upper fragment had perforated the skin. On enlarging the wound there was found a transverse fracture passing a short distance above the condyles, and from the centre of this transverse line a vertical fracture,

extending into the joint. The external condyle was drawn upward in front of the shaft, the internal condyle was displaced inward by the olecranon which was wedged upward between the condyles. An attempt to save the joint was made as follows: An incision, two and a half inches long, was made over and exposing the external condyle, holes were drilled through the shaft and the external condyle, a strand of kangaroo tendon was passed through the holes and tied, and the external condyle was thus brought into position. The olecranon was then drawn downward into place, and the internal condyle reduced. With the aid of an aneurism needle a strand of kangaroo tendon was passed through the outer wound, behind the condyles, then around the internal condyle, and then in front back to the point of entrance. The ends were tied over the external condyle, and thus the internal condyle was held firmly in place. Wounds left open and packed with iodoform gauze, sterilized dressing, right angle splint. Outer dressing renewed on third day, but the iodoform gauze was left in until the eleventh day. Healing was uneventful, the wounds closed by the fifth week, passive motion began at the end of the fourth week. The result is extremely satisfactory, flexion and extension nearly perfect, supination and rotation completely so. The arm is nearly as strong as before the accident, and the man is again working at his trade. The elbow was treated in the flexed position, as, in case of ankylosis resulting, the arm would be vastly more useful than if in an extended position.

ANEURISMAL VARIX OF THE HAND.

Dr. ABBE presented a boy, nine years of age, with an aneurismal varix, occupying the ring, the middle, and index fingers, as well as the palm and dorsum of the hand. When a baby, a small nævus was first noticed on the dorsum of the middle finger near the middle joint. This remained quiescent many years, but afterward grew a little larger. About a year ago, he sustained a deep cut with a knife at the base of the thumb; soon afterward the nævoid degeneration took on a rapid enlargement, until now it has attained the marked dimensions shown in the photograph. (Fig. 1.) The fingers have become several times larger than normal. There is a thrill at the base of the thumb, and apparently a connection between the artery and veins at that point, from which point, also, the rapid invasion of the neighboring parts started. There is undoubtedly some increase

FIG. 1.—Dr. Abbe's Case of Aneurismal Varix of the Hand.

in the size of the radial artery all the way up the arm, but it is likely that this is only coincident with the increased supply of blood demanded by the finger enlargement. There is no question in the family about the rapidity of the growth during the year since the accidental cutting, yet it is not possible to say that there was no connection between the arterial and venous plexuses before that time. It was not a mere puncture, but a free cut which occurred, and if there had been a varicose condition at this site, then it seems he would have bled to death. The inference is just, therefore, that the angioma did not extend so high up at the time of the injury.

Dr. ARPAD G. GERSTER inquired whether it was entirely beyond doubt that the present condition of this hand was induced by the injury one year previous. The statements of patients and relatives are not always entirely reliable. It seemed to him, since there was no very serious hæmorrhage at the time of the injury, that a wound of the arterial trunk could be eliminated. To be sure, it cannot be denied that a traumatism of any kind might induce changes like these, yet the proof of such a fact in this case has not been brought out.

As regards the pathological character of the condition present, it has been called by the president an aneurism. But he would not be so ready to subscribe to that diagnosis. If it were an aneurism, it would be pulsating, and a very distinct bruit would be heard along the continuation of the radial artery. Yet as those signs would be present in any case where the artery had rapidly enlarged, he would not regard them as sufficient to justify the expression aneurism. It seemed to him that this case belonged rather to the order of arterio-venous angiomata, a condition very frequently congenital and growing with the growth of the individual, involving not only the vessels which form the substratum of the condition, but all the tissues, even the skeleton of the parts affected. He had observed and operated upon a number of such cases, one of which he described: it occurred in a child, one entire lower extremity, up to the buttock, being involved. Ultimately the veins became thrombosed, and very severe attacks of phlebitis occurred, accompanied by high fever and serious interference with the circulation of the limb, so that superficial gangrene of the skin developed in several places. In order to ward off a possible fatal complication which was threatened in this manner, he finally amputated the limb through the diseased tissues. The vascularity of the cut surface was so great that he had, according to the statement of Dr. Kinloch, of Charleston, who assisted him, to

deligate about seventy-five arteries, yet the surface was still practically a spongy opening which would have caused fatal hæmorrhage the moment constriction was removed. In order to secure against the possibility of secondary hæmorrhage, he resorted to the plan of closing the entire surface by buried sutures, commencing at the periosteum and going out to the skin. The wound healed by first intention, and the girl is still alive and doing very well—seven years after the operation.

In another case, that of a boy, eleven or twelve years of age, the degeneration being limited to the toes, foot and heel, the external iliac artery was first ligated, and, as a consequence, rather extensive gangrene of the integument in the vicinity of the malady and of the bellies of both peroneal muscles developed, and the boy's foot had to be amputated. He finally recovered. In that case there was thickening of the dermal layer, so that certain portions of the foot had an appearance of ichthyosis. The extremities were inclined to be cold; the vessels, however, were very well marked, and there was a distinct bruit in all the arteries leading down to the foot, and the veins were all enlarged exactly as in the case presented by Dr. Abbe. The skeleton in both cases was decidedly enlarged, as ascertained by exact measurement.

Dr. ABBE rejoined that he had himself operated upon one case successfully which resembled very closely the one now before the Society. The whole arm was involved from the hand to the shoulder, presenting a sponge-like appearance, but there was not the bruit nor the history of traumatism with more or less rapid increase afterward. Were it not for the very local aneurismal thrill at a point quite near the scar in this hand, he would have thought this to be simply an angiomatous condition, but under the circumstances he preferred to class it under the head of aneurismal varix,—not varicose aneurism,—believing there is a connection between a rather large artery and a venous trunk close to the massive enlargement. The bruit can be heard over the entire mass with the stethoscope, but loudest at the seat of injury.

With regard to treatment, he tried several methods in the other case just referred to, resorting to excision of a part, and to actual cautery, and a cautery with the wire loop in other parts, cutting through the mass in planes with the cautery wire. He also tried Roser's method with stypic setons suggested by Professor Esmarch, who witnessed the cautery operations. But in a case like the present one he

would be inclined to cut down upon the point of apparent anastomosis and excise that portion. He intended also to try the Roser's method again.

Dr. McBURNEY said that as regards the diagnosis, he believed the case to be an aneurismal angioma, largely aneurismal. The traumatism might have divided an artery which opened into the spongy-like tissue or venous channels, but one would hardly call that a communication betwen a vein and artery. With regard to treatment, one would find it very difficult to ascertain the point of communication in such a case. There is, to be sure, technically, a communication between the venous and arterial systems, but one which would not be found during an operation. He would think that if any minor operation would do good, it would be ligation of the principal artery supplying the parts, but would not expect much from that, since if the blood were shut off from the radial artery it would probably find its way through the ulnar, or *vice versa*, or through the accompanying artery of the median nerve.

THE OPERATIVE TREATMENT OF CLUB-FOOT.

Dr. HARTLEY read the paper upon "The Operative Treatment of Club-Foot." (See page 257.)

Dr. WILLY MEYER presented a man, twenty years of age, on whom he had operated for marked varus at the age of sixteen. In addition to the bone operation he divided the tendo Achillis and plantar fascia. The deformity was congenital. The patient walked at present flat on the sole, and was ready to discard mechanical apparatus.

Dr. V. P. GIBNEY presented the following cases in illustration of the results obtained by operations in club-foot:

CASE I.—Joseph B., aged ten, came under treatment for extreme degree of club-foot, congenital, about two and a half years previous. The astragalus was removed, subsequently repeated stretchings, under ether, Thomas club-foot wrench being employed, later still the Wolff method. Result thus far not quite satisfactory, and a supramalleolar osteotomy is to be done on the right foot. Left foot is about perfect.

CASE II.—Katie K., a girl twelve years of age, has had repeated stretchings, numerous tenotomies and fasciotomies; finally, about a year and a half ago, removal of astragali, with subsequent stretchings, and is now, for the past six months, cured.

CASE III.—Miss A., seen first in December, 1887; aged twenty-one; extreme degree of club-foot, typical reel-foot; operation on Christmas day, 1887, Dr. Poore assisting; wedge-shaped piece removed from os calcis on right side down to near articular surface, about an inch in width; also wedge-shaped piece from the astragalus; being unable to get the foot straight, divided the deltoid ligament; being still unable, made an open incision on inner side of foot, cutting everything in reach; still not succeeding, took out more bone on outer side, and finally got the foot in what seemed to be an ideal position; considerable sepsis followed. In February the left foot was operated upon, Dr. Bull assisting; practically the same operation, encountering the same obstacles; an inch and a half wedge was removed; the wound healed primarily on this occasion; the result was excellent. The patient has been able to walk with convenience, and now makes her living by treading the organ with her feet. A shoe of special make is worn. This lady has no pain, can walk long distances, and requires very little attention in the way of shoe support. Does not wear any braces.

CASE IV.—Theodore U. was admitted May 11, 1891, having been at one time an out-patient, and the history is that a tenotomy on him was done in 1887. After that he came under the care, so reported, of Dr. Phelps, in 1889. The report further states that Dr. Phelps operated upon him, and the cicatrices at the time of his admission showed that some one had done the Phelps operation. He came into the Hospital for Ruptured and Crippled for relapsing club-foot.

On the 5th of May his astragalus was removed from the left foot, and the tendo Achillis divided at the same time. On the right foot the tendo Achillis simply divided. The feet were put in excellent position at the time of the operation, and plaster of Paris was employed to retain the good position. In the hospital he relapsed a little, and it was necessary, July 31, to employ manual force under ether to correct again.

On the 21st of August nitrous oxide was administered and manual force employed, both feet. Put up three weeks afterwards in club-foot shoes, and discharged June 30, wearing the Knight club-foot shoes.

He was readmitted December 2, 1892. The feet were still inclined to turn in and roll to the outer side, and, under ether, the Thomas wrench was employed, leaving the feet in calcaneo-valgus.

On the 21st of January, 1893, braces were applied.

April 1, 1893, while still in hospital, it was found that he turned a little again, and the Wolff method was instituted. This was employed up to the 20th of May, and discontinued on account of excoriations. On the 21st of July the Wolff method was resumed. On the 22d of August very little had been accomplished, and under ether manual force was again resorted to. On the 11th of October it was thought that there was some improvement, the Wolff method having been employed immediately after the administration of ether, on August 22. October 25 we were not satisfied with his condition, and a supramalleolar osteotomy was done subcutaneously.

Only to-day the plaster dressing has been removed. The final result is yet to be determined.

Dr. GIBNEY approved of Dr. Hartley's determination to get the foot straight at all hazards. Some operators limit themselves to the method which cuts through the cuboid and scaphoid; some cut the os calcis alone; others think removal of the astragalus will meet every indication, and stop there; others limit themselves to open section of resisting soft tissues; but the surgeons at Roosevelt Hospital have been bound down by no hard and fast rule, but to remove any bone which would relieve the deformity,—taking out the astragalus, making the double cuneiform operation, and dividing everything offering resistance,—aiming to get the foot into a position in which the patient could walk upon it without the use of apparatus. Most patients operated upon by surgeons who have a pet method go about afterwards with some form of apparatus.

Dr. MCBURNEY remarked that, although the operation in these cases may look somewhat formidable, yet his recollection was that in none of the cases at Roosevelt Hospital during the last five or six years had there been a disagreeable result; that is, no suppuration or chronic disease of bone had followed. Another important point is the enormous saving of time which is implied in the operative treatment. This is particularly important to the young individual whose development would be interfered with if he were compelled to wear apparatus for many years. Were a successful operation performed the patient would soon recover, and be able at a much earlier period, than if mechanical treatment alone were applied, to walk, play, and live like other children.

One of his patients was a child which had been treated six years by a skilful orthopædic surgeon, who, however, had limited himself to

tenotomies and mechanical apparatus. Keeping a child in apparatus for so long a period, meanwhile subjecting it to a number of tenotomies, would be found to have an important bearing upon the mental, moral, and physical development. Another point of very considerable importance, and which again endorsed the position taken by the author, was the matter of expense. He did not mean expense to the patients, for a great many of them were treated free, but expense to the institution, to the surgeon, and to the community at large.

TUBERCULOSIS OF THE BLADDER—SUPRAPUBIC CYSTOTOMY.

Dr. PILCHER presented the genito-urinary tract of a man, twenty-five years of age, the history of which was as follows: He had been admitted to the Methodist Hospital in Brooklyn, coming from the interior of New York State, for the relief of a severe chronic cystitis. He was much emaciated, and had much cough, but the severity of his bladder symptoms were such as to dominate everything else. This condition had lasted for more than a year.

A cystoscopic examination showed extensive ragged ulcerations of the bladder mucosa, but was soon embarrassed by the bleeding provoked by it. By rectal examination a thickened condition of the vesiculæ seminales was well defined. Examinations of the urinary deposits for the bacillus of tuberculosis were made, but with negative results.

A far-advanced pulmonary tuberculosis was evident, and that the disease of the bladder was tuberculous was extremely probable.

The patient, after a few days' observation, was accordingly subjected to suprapubic cystotomy, in which operation Dr. Pilcher, for the first time, resorted to inflation of the bladder with air instead of dilating it with water injected into it, at the same time doing away with the use of the rectal colpeurynter, according to the method suggested by Dr. Bristow, of Brooklyn. The effort succeeded admirably. The bladder, easily blown up, was at once lifted up prominently above the symphysis, and the usual suprapubic incision was more than usually facile in its doing. Post-mortem examination of the bladder showed another advantage to have been gained by this air-inflation in this particular case, for the bladder was the subject of two very thin-walled diverticula which might readily have been ruptured by the pressure of a fluid-injection; moreover, the whole blad-

der had lost so much of its tone as to be like a flaccid bag, with but little expulsive power.

The weak condition of the patient made unwise any extended inspection of the bladder after it was opened, and the reporter contented himself with a simple digital exploration of it, which revealed a diffused granular degeneration of the mucosa; it was then thoroughly washed out and an iodoform gauze tampon placed in it, the end of the tampon being brought out through the suprapubic opening; this was withdrawn on the third day; daily irrigations of the bladder were practised thereafter. Twice weekly a half an ounce of a ten-per-cent. iodoform emulsion was injected into the bladder and permitted to remain. From the time the opening into the bladder was made until his death no longer did his bladder symptoms play any important part in his condition. He continued, however, steadily to sink and waste from his pulmonary disease, and at the end of six weeks died.

The post-mortem examination revealed a diffuse tuberculosis of both lungs and of the intestines, and of the bladder as presented. The bladder specimen shows a diffuse granular condition throughout its whole extent except at the trigone, whose surface was smooth and reddish, with depressed areas apparently from recently-healed ulcerations. The ureters, however, are free from disease, nor is there any involvement of either kidney. On either side of the bladder a loop of small intestine is adherent to it, and by long traction the bands of adhesion have been elongated into cords of some length, and a diverticulum from the lateral wall of the bladder has been developed.

HOUR-GLASS GALL BLADDER.

Dr. PILCHER also presented a specimen which he said was chiefly of interest in connection with the case of hour-glass gall bladder presented at the last meeting of the Society by Dr. Hotchkiss. (See page 197.) The patient had died in his service after an operation for relief of strangulated umbilical hernia. At the autopsy he found an hour-glass gall bladder, the upper part of which contained a calculus which distended it, while the lower part, smaller in size, separated from the upper by a distinct constriction, contained glairy, flocculent fluid. He showed the specimen as suggesting an explanation for the condition present in Dr. Hotchkiss's case, where the gall bladder was divided into two portions by a thick constricting band.

In the specimen just presented the dividing band consisted apparently of new inflammatory tissue which may have developed through irritation set up by the calculus, the latter occupying one end of the gall bladder, the more distended end, and fluid occupying the other end. He could easily imagine how, by continued action of this force, greater dilatation might have taken place, with further irritation and contraction of the constriction band until the gall bladder would have presented two well-defined sacs communicating with each other by a comparatively narrow aperture.

REVIEWS OF BOOKS.

A Treatise on Diseases of the Rectum, Anus and Sigmoid Flexure. By Joseph M. Matthews, M.D. New York: D. Appleton & Co., 1893. 8vo, pp. 537, with six chromolithographs, and numerous illustrations.

That so large a book as this, confined to so narrow a field, should be issued at this time, when the English language already contains so many others devoted to the same theme which present the present state of the pathology and treatment of the diseases in question, argues a confidence both by the author and publishers in a great interest in this subject in this country. As the reader perceives the enthusiasm and the diligence which the author evidently brings to his own labors in his chosen field, one quickly feels, however, that this book has an individuality of its own. Insensibly one is led to see everything with the author's eyes, and to realize that the reason for this book being in existence is to be found in the special views and practice of Dr. Matthews himself, and that as these are valuable or susceptible of criticism, does the worth of the book appear or diminish. There is a breezy positiveness, a dogmatic assertiveness, a polemical combativeness, running through the book which makes it very interesting reading. Withal, its teachings are in the main sound and wholesome, and its wide circulation cannot fail to encourage the development of better views and sounder practice in diseases of the rectum and anus.

The author states in his preface that for fifteen years he has been a rectal specialist, and on the title page he is announced as a professor of the principles and practice of surgery in a medical school. The two announcements raise a train of curious speculation in one's mind as to how the two things can be harmonized, particularly in view of

his further statement a few pages farther on that he has been the first reputable surgeon in the United States or Europe to make a specialty of rectal diseases, meaning, evidently, the restriction of attention to these diseases exclusively. Reading on a little farther we find him speaking of the frequency of the existence of uterine and ovarian troubles, together with rectal disease in women, with the advice that whenever such a condition should be suspected the aid of a gynæcologist should be called in, and in yet another place the assistance of a specialist in the genito-urinary diseases of males is invoked. One cannot but feel that there is something wrong when the human pelvic organs have to be split up in this way. The surgeon who confines himself to the reproductive organs of the female, or the genito-urinary tract of the male, or the defecatory apparatus of both sexes, certainly has a very narrow path in which to walk. It ought not to put too great a strain upon the cerebrating apparatus of one man to acquire a good working familiarity with all the organs of the pelvis in both sexes. If we mistake not, the trend of enlightened surgical sentiment at the present moment is against undue specialism, particularly that which artificially cuts off for itself a special segment of a general apparatus.

Visions of Anthony Comstock and the Society for the Suppression of Vice must have dictated the choice of the cuts which illustrate the positions recommended for rectal examinations, for the parts involved are all fully covered from view by well-made pantaloons in each instance. This part of the book contains a first-class, entirely needless, advertisement of a very cumbrous and somewhat complicated sofa, the name and address of the manufacturing company which makes it being specially given. All this, when a plain ordinary cheap four-legged table is unexcelled for the purpose. When the author comes to speak of illuminating apparatus, the same kind of advertisement of a special electric apparatus is inserted. Aside from these flaws, and the too free use of the style of the clinical lecturer who is talking to students, the chapter on examinations is an excellent one. He praises deservedly the value of the finger as an explorer, and con-

demns the use of bougies and rectal sounds for purposes of exploration. He describes a good bivalve wire-bladed anal dilator, and briefly hints at a rectal endoscope. He is open to criticism in not giving prominence enough to the value and importance of general anæsthetization for physical exploration of the rectum. The second chapter is devoted to anatomical considerations, and is in accord with the present generally-accepted views. It seems peculiar to read of the external sphincter muscle *opening* and closing the anus, but so the text says. Rectal surgeons are warned against unnecessarily injuring this muscle.

After a chapter, each, devoted to constipation and to antiseptics, he comes, in the fifth chapter, to hæmorrhoids, which, with fistula in ano, forms the chief claimant for the attention of the rectal surgeon. Three chapters are given to the discussion of piles and their treatment. External piles he advises to be excised. The chapter on internal piles is a strong one; he gives vigorous and well defended reasons for his teachings that palliative treatment is to be discouraged, for if real piles are present they can be cured only by operation. The best treatment for inflamed protruded piles is to remove them at once, after the bowels have been unloaded. He denounces carbolic acid injections, disapproves of treating by crushing, uses the clamp and cautery only in exceptional cases, does not regard simple excision with torsion of divided vessels as safe, denies that real internal piles can be cured by simple dilatation of the sphincter, rejects *in toto* Whitehead's operation of excision of the pile-bearing area of mucosa, and finally advocates warmly the routine practice of ligating piles as the method most simple and effectual, the freest from pain and danger, and attended with the most speedy convalescence. The description of all the details and precautions to be observed which may contribute to success in the ligation of piles is full, clear and practical. In several places in the book, as on page 167 in this connection, the application of "boiling-hot" water to the anus is recommended. Doubtless, an excellent hæmostatic measure, but likely to be attended with inconveniences that would limit the frequency of its applicability.

For fistula in ano, his remedy is the knife. He strongly brings out the importance, after first laying open the main sinus, of hunting out and laying open all secondary sinuses. His remarks upon operating for fistulæ in phthisical patients are very just and in accordance with common sense.

As to irritable ulcer or fissure of the anus, he is emphatic in the statement that a simple divulsion of the sphincter will cure the vast majority of fissures. If the knife is to be used at all it is simply to scarify the ulcer proper, not to be carried into healthy tissue, much less to divide the sphincter itself.

Chapter XV is devoted to non-malignant strictures of the rectum. He rules out absolutely dysentery as a cause of such stricture, giving good grounds for his opinion. More than half of all cases he believes to be due to syphilitic gummata. In the treatment of strictures in the lower three or four inches, he prefers divulsion and incision ; stricture higher up calls for colotomy.

To cancer of the rectum three chapters are devoted. The histology and pathology of malignant growths of the rectum are dismissed by referring the reader to a book by another author, while the present author goes on to consider matters of diagnosis. One is quite prepared, therefore, to find that he has but little use for the microscope as a diagnostic aid. This part of the book is not up to the standard of other parts. The descriptions are diffuse, involved and confused, and do not well represent present knowledge on the subject, but the statements of his practical conclusions, as to radical treatment, are clear and positive. In this part of the treatise the polemic feature is especially marked. Colotomy he believes to be warranted only in the rarest cases, and then only as a *dernier ressort.* When it is to be done, he prefers the lumbar operation. Extirpation is advised in incipient cases, the patients being otherwise in good state. In more advanced cases, with symptoms of obstruction, if close to the anus, he advises to divide the obstructing mass by an internal linear incision ; if deep incisions have to be made, the external parts should be divided also. Very little is said about the possibilities of removal of high-lying growths. An entirely inadequate

treatment of the operative conditions likely to be met with in attempts at removal of such growths is found. The chapter is a disappointing one to one who wishes to know the present state of surgical effort in this region, although it is clear and complete enough in its presentment of the author's own views and practice.

Affections of the sigmoid flexure, prolapsus ani, pruritus ani, impacted fæces, villous tumor of the rectum and malformations, each receive attention in the succeeding chapters of the book. We close the book feeling that it has been written for a certain constituency, and that it is admirably adapted by the very features which we might otherwise be most inclined to criticise to gain attention and command a following. It vigorously antagonizes much error; insists upon thoroughness of examination and positiveness of diagnosis; it is radical in matters of safe procedure and conservative in those of more vital moment. It cannot fail in its special field to promote better and safer work. Though we have not hesitated to point out what seemed to us shortcomings in this work, nevertheless, on the whole, it is worthy of high commendation.

L. S. PILCHER.

THE DISEASES OF CHILDHOOD. By H. BRYAN DONKIN, F.R.C.P. 8vo. 1893. New York: Wm. Wood & Co.

The writer of this book is one of those who takes the position that while childhood offers many distinct and peculiar manifestations of disease, they are not sufficiently distinct to make of them an exclusive specialty. He writes more for general practitioners and advanced students. By far the greater portion of the material presented is taken from his own note-books and personal experience. He presents a very pleasing arrangement of his own ideas based on personal experience. He has devoted himself exclusively to the medical diseases, and, for convenience, has made three classes based upon age. From birth to the end of the second year he refers to as Infancy; from this time to the end of the fourth year he speaks of as Early Childhood; and from the fourth to the fifteenth year he classes as Childhood. The subjects treated are arranged under attractive headings, and throughout the entire book,

of four hundred and twenty-four pages, the author has adopted and maintained a conversational style, which gives the book a peculiar charm. At no point does one encounter a dictatorial spirit, but, on the other hand, there is always the feeling that he is addressing you more or less personally; and particularly in referring to special or unusual cases is willing, and, in fact, prefers, to leave much to the intelligence of the reader.

While possessing decided views of his own, he is always mindful that on many points others can and do truthfully disagree with him. His opinions of the comparative value of tracheotomy and intubation in cases of membranous laryngeal obstructions are either based upon insufficient data or else are tinged by an English prejudice, a condition which he practically admits upon page 351.

The material in his appendix to Section III, embodying an abstract of the conclusions given in the "Report of a Committee Appointed by the Clinical Society of London, to Investigate the Periods of Incubation and Contagiousness of Certain Infectious Diseases," is valuable, and serves to fix this data and place it in a form for permanent use. Mention is briefly made of the Klebs-Loeffler bacillus in diphtheria, and the hope is expressed that it may become a means of general clinical assistance. Up to the time, however, of going to press the matter was not sufficiently well understood to warrant him in making any positive claims for it or to arrange any of the technical methods by means of which clinical use might be made of it at the bedside.

Upon the subject of treatment, the book is refreshingly brief and to the point. The text is nowhere burdened with a multiplicity of confusing formulæ, but here, as elsewhere, one is impressed with the feeling that what is said is thoroughly practical. The purpose which the author had at the beginning has been well carried out, and the book becomes a valuable addition to a rapidly increasing number upon the same subject. Clearly, the purpose of the author has been to formulate useful principles of action, leaving individual and unusual cases to the general intelligence of the physician.

FRANK WHITFIELD SHAW.

CHIRÛRGIE DES VOIES URINAIRES. Études Cliniques par le Dr. E. LOUMEAU. Second edition, revised and enlarged. Five chromo-lithograph plates. Bordeaux: Feret & Fils, Libraires-Editeurs, No. 15 Cours de L'Intendance, 1894. (Surgery of the Urinary Passages.)

For the surgeon who is interested in recent developments in genito-urinary surgery this work is of value. It is a compilation of the various reports published by the author since 1891; some of them have already appeared in pamphlet form.[1] The cases are given in chronological order as they came under the author's care, and in every instance the previous history of the case, the details of the case, the details of the operation, if one was performed, and the subsequent results, are minutely given.

Doctor Loumeau has not hesitated to give an account of his mistakes with the same freedom and exactitude that he has accorded to his successes. This is illustrated by the account of a case of laparotomy, in which the bladder was not recognized and was resected during the operation. The details of this case will be given in full in a future number of the ANNALS OF SURGERY.

Many interesting accounts are given of conditions demanding surgical interference, involving various parts of the genito-urinary system. Kidneys, ureters, bladder, prostate and urethra all furnish material for the book, and among the pathological changes found are all of the common diseases of these organs, as well as many extremely rare forms.

Among these latter may be mentioned a case of perinephritic abscess which opened externally through the bronchial tubes; a case of stricture of the urethra in the female in which an internal urethrotomy had to be performed; and a remarkable case of a calculus in the urethra.

A number of cases of cystitis of gonorrhœal origin in which the

[1] Chirurgie des Voies Urinaires, Études Cliniques. Bordeaux: Feret & Fils, 1892. 8vo, 70 pages.

treatment was by means of sublimate instillations are described in full elsewhere.

Besides the mere clinical account each of the chapters is made more valuable by the historical references and by the bibliography of the subject which are given. Five colored plates illustrate some of the rarer conditions found.

The author's style is clear and concise; the various topics are well classified; the arrangement is very systematic; altogether the book is a model for the presentation of clinical studies.

H. P. DE FOREST.

LES MALADIES DU SOLDAT, étude étiologique, épidémiologique, clinique et prophylactique, par le Dr. A. MARVAUD, Médecin principal de 1re classe de l'armée, Médicin-chef de l'hôpital militaire de Villemanzy à Lyon, Professeur agrégé libre à l'école du Val-de-Grâce. Paris: Felix Alcan, Editeur, 1894. Royal 8vo, pp. 870.

DISEASES OF THE SOLDIER. By A. MARVAUD.—This elaborate treatise is another evidence of the thorough and comprehensive work done by the medical department of the French army under the stimulus of the school of Val-de-Grace. It is an effort to furnish, not only the regular medical officers, but such medical men as may be called upon to serve in the reserve and the territorial army, with a practical discussion of all the peculiar features of military medicine.

The author divides his subject into five parts, the first of which is a general study of conditions affecting health, the sick-rate and the mortality of the soldier, as present in the varying circumstances of military life in garrison, in camp, and on the march. The remainder of the book is devoted to the special study of the affections most frequently seen among soldiers. In the second part he considers infectious diseases, quite properly giving to them the detailed consideration which their large preponderance in military pathology and mortality demands. This subject occupies nearly two-thirds of the book and includes especially complete discussions of typhoid fever, tuberculosis, vaccinia and vaccination, malarial affections and dys-

entery. Under the head of "Other General Diseases," he considers in the third part rheumatism and weak constitution, the latter an affection found among bodies of conscripts, but rarely seen in an army recruited under the severe physical requirements demanded for admission to our own service. The fourth part is devoted to the study of diseases affecting specific organs and systems, such as those of the respiratory system, the digestive system, the eye, the ear, etc. And in the last part are considered certain diseases of soldiers arising from accidental causes, including venereal diseases, alimentary affections and troubles due to excess of heat or cold.

The author has endeavored as far as possible to exclude all matter not pertaining directly to military medicine, dwelling particularly upon the phases of disease especially liable to arise in camp and garrison. So far as appears upon the first reading of the work, nothing is presented that is not worthy of commendation. It fills a field hitherto inadequately occupied, and it fills it well.

JAMES E. PILCHER.

PATHOGÉNIE DES DIVERSES OSTÉITES. By Dr. RENÉ CONDAMIN. Paris: 1892.

This volume, although it does not represent much original work nor add any special fact to our knowledge of the pathology of bone inflammation, represents, however, a most excellent *résumé* of the recent work done in the direction of the pathology of bone inflammation. The author deals with every form of osteitis, commencing with those produced by phosphorus, mercury and arsenic. A short chapter is devoted to osteitis of nerve origin. Osteitis deformans is dealt with, and the question as to whether it is a true inflammatory affection of the bone is well discussed.

The greater part of the book is occupied with the infective forms of bone inflammation, and especially interesting are the sections dealing with osteo-periostitis due to the bacillus of Eberth, with actinomycosis of bone and the osseous affections which follow upon the eruptive fevers.

AIDE-MÉMOIR DE CLINIQUE CHIRURGICALE ET DE DIAGNOSTIC. By PAUL LEFORT. Paris: 1893.

This volume belongs to a series of students' small books, which are especially written for those preparing for examination. This deals with clinical surgery, surgical diagnosis and therapeutics, and with minor surgery. There is, as a rule, little that is good to be said of condensed manuals designed for the purpose of assisting cramming, but it must be confessed that this little volume is an exception to that statement. It is evidently written by an experienced teacher. The subject is dealt with liberally and intelligently: the author deals with first principles, and does not allow mere detail to obscure the few great general facts which form the most important part of the matters discussed. One would be pleased to see some such book as this reproduced in English.

CLINIQUE CHIRURGICALE. By A. RICHET. Paris: 1893.

Professor Richet has collected in this volume a number of lectures upon various topics. The subjects which are dealt with at greatest length are the following:

Inflammatory affections of the shoulder-joint, their pathology, diagnosis and treatment. Three lectures on rhinoplasty and cheiloplasty, and a very valuable and exhaustive account of fractures of the leg. The treatment applied to them, although different from that employed in England, will be of interest to practical surgeons.

The tendency of French writers to be somewhat unsparing in words may be illustrated by the fact that the lecture on fractures of the leg occupies no less than eighty-eight pages.

THE MEDICAL ANNUAL. 1893. John Wright & Co., Bristol, Eng.

This admirable work improves in the nature of its contents and in its usefulness every year. It carries out what it professes to do,—that is, to provide a condensed account of the progress of medicine and surgery for the year. The work is not a mere compilation of abstracts and extracts from journals, but provides a well-digested account of the chief items of progress in the various departments of

surgery. So far as the present volume is concerned, attention may be directed to the very valuable contributions by Mr. Mayo Robson on abdominal surgery, by Dr. Ruffer on bacteriology, and by Mr. Robert Jones on orthopædics.

Professor Sonnenburg contributes an article on perityphlitis, which deals with the clinical aspects of the affection as well as the treatment.

Professor Trendelenburg writes a contribution on the treatment of varicose veins by the ligature of the trunk of the great saphenous vein. The book is well illustrated and well got up, and is a credit to all those who are concerned in its production.

ANÆSTHESIA. By DR. HEWITT, Teacher of Anæsthetics at the London Hospital. London: 1893.

Dr. Hewitt has produced a volume which may, perhaps, lay claim to present the most scientific account extant of anæsthesia. The work is most elaborate, most precise and most suggestive.

The author's conclusions are founded upon a vast experience, and upon very careful observation. A great number of illustrative cases are given which serve to bring before the reader in a graphic manner the points considered by the author.

To those who are concerned in the discussion as to the use of chloroform it will be interesting to hear that Dr. Hewitt is a believer in ether, and recommends that anæsthetic for general use.

The work is divided into four parts.

Part one deals with the properties of the chief anæsthetic agents, the general condition of the patient, the selection of the anæsthetic and the preparations for its administration. The second part deals with the administration of the selected anæsthetic. Part three concerns itself with the management and the treatment of the difficulties, accidents and dangers of general anæsthesia. The work concludes with an account of the condition of the patient after the administration.

FREDERICK TREVES.

CORRESPONDENCE.

OPERATIONS FOR RUPTURE OF BLADDER.

LOUISVILLE, KY., December 20, 1893.

Editors Annals of Surgery:

In the ANNALS OF SURGERY for December, Dr. James Kerr presents, in his paper on "Intra-peritoneal Rupture of the Bladder," a table, compiled by him from medical literature, of the reports of the operation. The case I reported at the meeting of the American Medical Association, in May, 1888, at Cincinnati,—with the presentation of the recovered patient at the meeting,—which report was subsequently published in the journal of the Association for July 28, 1888, is omitted from Dr. Kerr's table by oversight. I call attention to the omission chiefly to note the fact that this case was the first, and, so far as my knowledge extends, is still the only one, in which the ideal operation—*i.e.*, suture of both the bladder and abdominal wound—has been followed by recovery on this continent.

Respectfully,

H. HORACE GRANT.

TO CONTRIBUTORS AND SUBSCRIBERS.

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FIBROUS STRICTURE OF THE ŒSOPHAGUS TREATED BY GASTROTOMY AND RETROGRADE DILATATION.[1]

By KENDAL FRANKS, M.D., F.R.C.S.I.,

OF DUBLIN,

SURGEON TO THE ADELAIDE HOSPITAL.

IN March, 1890, I had the privilege of laying before the Academy the details of four cases of fibrous stricture of the œsophagus treated in various ways. One was treated by gradual dilatation, the treatment occupying over seven months. One was treated by electrolysis alone, the current being applied on eleven occasions, extending over a period of four and a half months. In the remaining two cases immediate dilatation or rupture was employed followed by the use of bougies, in one case daily for two months, in the other, in which this treatment was supplemented by electrolysis, for eighteen days. I am glad to be able to report that in all these cases the patients are at the present time in good health and in no way troubled by their former strictures.

I now desire to add to this list a case of fibrous stricture of the œsophagus situated near the cardiac orifice, which, owing to the difficulty of getting through it bougies passed through the mouth, required to be treated by a method different to any I had hitherto employed.

The case was that of a young lady, aged twenty-four, who consulted me on June 16, 1892, for dysphagia. The history of her trouble began when she was seven years of age, after an attack of scarlatina. For two years after that she found the greatest difficulty

[1] Read before the Surgical Section of the Royal Academy of Medicine in Ireland, January 12, 1894.

in swallowing solids. Sometimes when taking a long drink she felt as if something were sticking in her throat. At the end of two years she was able to take soft solids, but it was several years before she was able to eat meat. At this period she was living in Belfast, but five years previous to my seeing her she came up to school in Dublin. In 1890, as the dysphagia was becoming worse, she consulted Dr. McCutcheon. In June, 1892, he kindly sent her to me. She told me that every mouthful felt as if it would choke her, especially if it were a little larger than usual. On one occasion about ten years previously a piece of citron had stuck in the gullet, and did not come up again for a month. Sometimes she found even fluids difficult to get down, especially if they were effervescing. She never suffered from nausea, the food, as a rule, simply regurgitating shortly after it was swallowed. The severity of the symptoms varied a good deal, and was increased when she was in a strange house or by nervousness. Her general health was good and all the functions normal. As a rule, she was not able to get down sufficient food to satisfy her hunger, and she was losing flesh. She was anæmic, and had lost strength and energy. She was five feet two and half inches in height, and weighed five stone seven pounds. A year previously she weighed eight stone.

On examination with a full-sized œsophageal bougie, I found that it passed readily down the œsophagus until it reached a point about twelve and a half inches from the teeth. Here it was arrested. I then proceeded to determine as nearly as possible its exact position.

The stricture was 12½ inches or 32½ cm. from the teeth. Mackenzie gives the distance of the opening of the œsophagus from the teeth as 15½ to 17 cm. Assuming that in a girl of her size this distance was approximately 16 cm., the obstruction was situated at a point about 16½ cm. from the upper opening of the œsophagus. Now Mackenzie states that the normal length of the œsophagus in the adult is 24 to 26 cm. Supposing that the lesser figure was near the truth in this case, the stricture was situated about 7½ cm. from the cardiac orifice,—that is, nearly 3 inches.

I tried repeatedly to get a bougie to pass. The impression which my attempts made upon my mind was that I had to do with a largely dilated *cul-de-sac* low down in the œsophagus, at some portion of the floor of which there was an opening, if only I could find it. There was evidently no growth to deal with, judging by the sensation conveyed through the bougies. The success which attended these attempts was very limited. On three occasions only, on June 16,

18, and 21, I succeeded, after prolonged probing with the bougie, in getting instruments which measured seven millimetres (a little over a quarter of an inch) in diameter through the stricture. I could not get a larger instrument, and the only good which resulted from passing these bougies was the information they afforded as to the nature of the stricture with which we had to deal. They showed that the stricture was firm and quite smooth and regular.

On June 30, Dr. Ball met me in consultation. He again endeavored to pass bougies, but failed to find the opening. We came to the conclusion that the best thing to do for the patient was to attempt to reach the stricture from below through an opening in the stomach. The advantages of this method of reaching the obstruction were that, as the measurement showed the stricture to be about three inches from the cardia, it would be possible to reach it and possibly to bore through it with the finger; secondly, the œsophagus below the stricture not being dilated as it was above, it would be a much simpler matter to guide an instrument through the stricture from below, and there seemed to be very little likelihood of dilating the stricture from above. The risks and advantages of this method were placed before the patient, and she readily agreed to operation, feeling that any risk was worth incurring provided she could be relieved from the slow process of starvation she was undergoing.

On July 6 the patient was placed under anæsthesia by Dr. Piel, at 10.30 A.M. Dr. Ball assisted me at the operation, and Professor Lannelongue, of Paris, and Dr. Heron Watson, of Edinburgh, favored me with their presence. An incision five inches in length was made in the middle line from the ensiform cartilage downward. When the peritoneum was opened the left lobe of the liver appeared, and behind and to the left of this the stomach was found. It was so contracted that it looked at first like the colon, but when it was drawn outward through the wound the absence of white bands and the arrangements of the blood-vessels proved it to be the stomach. An opening about an inch in length was then made into the stomach through its anterior wall about midway between the curvatures and at an equal distance from each orifice. The wound all round the opening was well packed with sponges, and the stomach was washed out with warm boric solution. Nothing but mucus and gastric secretions was found in the stomach. I then passed my right index finger into the stomach and my whole hand into the abdomen, and, pushing the anterior wall of the stomach before me, I readily found the cardiac orifice up

behind the left lobe of the liver. When I had passed my finger up the œsophagus as far as it could reach, I just succeeded in reaching the stricture and exploring it, but the length of my finger would not permit me to do more. As, from the measurements I had taken, I had anticipated this difficulty, I had an Otis dilating urethrotome in readiness, with the blade removed. I now passed this instrument up along my finger through the cardiac orifice, and, guided by my finger, it readily passed into the stricture, which it fitted fairly accurately. The dilator was then screwed up to its full limit of expansion in an antero-posterior direction, and was then withdrawn fully dilated. A flattened œsophageal bougie was then passed down the œsophagus from the mouth, but it impinged on the stricture and refused to pass farther. The dilator closed was again passed upward and again fully expanded, this time in a lateral direction,—that is, at right angles to the former dilatation. It was again withdrawn fully open. The bougie passed from the mouth now emerged into the stomach without the smallest difficulty. I drew its extremity out through the abdominal wound and bored a hole through it. Through this hole I passed a stout piece of silk and knotted it firmly. I then withdrew the bougie back along the same road it had already traversed, carrying the silk with it. I now had a strong silk thread passing from the mouth through the œsophagus, the stomach, and out through the abdominal wound. A plug of gauze was now made about the size of the finger. To one end of this the lower end of the silk was fastened securely. I then fastened another piece of silk to the other end of the plug, and by means of these silk threads I was able to draw the plug upward and downward through the stricture, which it traversed with comparative ease. Finally, I allowed the plug to remain in the stricture, and then I cut short the lower end in the stomach, leaving the upper line of silk hanging from the mouth.

The wound in the stomach was now closed by a continuous suture of fine silk, uniting the mucous coat, and a second continuous Lembert suture, which united the peritoneal coat. The stomach was then allowed to fall back into the abdomen. When the "toilet" of the peritoneum was completed the abdomen was closed by two rows of sutures, the first uniting the peritoneum, the second embracing all the other layers, including the skin. The dressings were applied, and the patient, who bore the operation very well, was removed to bed, and $\frac{1}{6}$ grain of morphia with $\frac{1}{120}$ grain of atropia was administered hypodermically. She was ordered peptonized nutrient enemata every four

hours. At 6 P.M. I withdrew the plug. She was allowed to suck a little ice, but nothing else was given by the mouth until the fourth day, when four ounces of milk and two drachms of Denayer's peptonate of meat were given alternately every fourth hour. The enemata were discontinued on the fifth day, as she was then able to swallow her nourishment well. On the ninth day she was allowed fish and bread and milk, and chicken on the tenth day. On the thirteenth day I passed a bougie with ease into the stomach; but that night she suffered some pain, and the next day there was a slight rise of temperature, which, however, came down the following day; but at no time during her convalescence did the temperature exceed 100.2° F.

On the twenty-first day she walked up to my house to see me. She was then able to eat good solid meals without the smallest difficulty or pain.

For over two months I made no further attempts to pass a bougie. On the 28th of September, 1892, I found the patient very much improved in health and condition. She now weighed six stones thirteen pounds as against five stones seven pounds on June 30,—that is, a gain of nearly a stone and a half.

I also found that I could pass a bougie No. 27, French gauge, with ease. On September 30 I passed a bougie measuring $1\frac{7}{16}$ inches in circumference. On October 26 I began electrolysis, and repeated it at intervals varying from a fortnight to a month until January 25, when my largest electrode, measuring two inches in circumference, passed with ease. Since then I have passed at intervals of from one to two months large bougies measuring $2\frac{1}{8}$ inches in circumference, which pass without any difficulty or pain. She enjoys excellent health.

The idea of attacking an impermeable stricture of the œsophagus, of a benign character, from below originated with Professor Loreta, of Bologna, and his first operation was performed in October, 1883.

As the case I have just recorded is, as far as I am aware, the first of the kind performed in the United Kingdom, it may not be uninteresting if I refer shortly to the history of the operation and point out the various modifications which have found favor with operators. Including the case I have recorded, the operation has been done 21 times, of which 7 have been per-

formed in Italy, the country of its birth, 3 have been done in America, 1 in France, 9 in German-speaking countries, and 1 in Ireland. Of these 21 cases, the result is known in 20. These all recovered. I have been unable to find the result of Case 13.[1]

On examining the record of these cases, it will be observed that surgeons have employed one of two methods in carrying out the treatment of œsophageal strictures by dilatation from below. The whole process may be completed at once, or it may be divided into two stages.

As originally proposed and carried out by Loreta, as soon as the stomach has been exposed it is opened, the cardiac orifice is sought for, a dilator, guided by the finger, is passed through the stomach into the œsophagus and is insinuated into the stricture, and the stricture is at once forcibly dilated. That sufficient has been done is tested by the passage of a bougie from the mouth downward. The stomach wound is then immediately closed, the abdominal wound sutured, and the operation completed.

The other method consists in at first performing gastrostomy, —that is, in fixing a piece of the stomach into a wound made in the left epigastric region. The stomach is not usually opened for two or more days, and nothing further is done until a gastric fistula has become firmly established. When this is attained (in Dixon's case, Case 18, twenty-four days after gastrostomy), the stricture is attacked through the fistula, generally assisted by the passage of various devices from above. When dilatation has sufficiently advanced to permit of the further treatment being carried out from above, the gastric fistula is allowed to heal, or is closed by a plastic operation.

Each of these methods has its own advantages. The former, or Loreta's method, completes the operation at once, and nothing remains to be done except to secure the patient against the risks of recontraction by the occasional passage of a bougie through

[1] I have not included in this list the case reported by R. F. Weir in the New York Medical Record, 1891, XL, 89, as, although gastrotomy was performed, the stricture was subsequently dilated from above. It was not a case of retrograde dilatation.

the mouth. The recovery is rapid: in Loreta's first two cases, eighteen and twenty days respectively; in my own case, twenty-one days. Again, the immediate method enables the surgeon to make a digital examination of the stricture, even if it be situated as high up as three inches above the cardiac orifice. It is impossible to explore even the cardiac orifice with the finger through a gastric fistula, unless the patient be a child and the fistulous opening in the stomach be large enough to admit the finger. In a case recently in which I had the opportunity and privilege of assisting Mr. Myles, we found it impossible to pass the finger into the lower end of the œsophagus, except after the introduction of the entire hand into the cavity of the stomach. We then discovered the stricture about three inches from the cardia; but, unfortunately, it proved to be malignant, and dilatation was impossible.

The second method, or the operation *à deux temps*, may perhaps be shown to have some slight advantage on the score of safety, but this I very much doubt. The table of cases which I have drawn up does not help us in this matter, as they do not show a fatal result from either method of procedure hitherto. But even if there were some slight additional immediate risk in Loreta's method, this is more than counterbalanced by the advantages, immediate and remote, of finishing the operation at once, and leaving the patient without a gastric fistula, which at any rate in one case, Case 16, had not closed at the end of fifteen months.

There is, however, one class of cases in which Loreta's method would not be admissible, and in which the establishment of a gastric fistula becomes a matter of necessity. In cases of extensive injury to the œsophagus, caused by swallowing a strong corrosive, such as sulphuric acid or caustic potash, where the greater portion of the whole length of the œsophagus is in a strictured condition, it would be manifestly impossible to employ immediate dilatation for its relief. A prolonged system of gradual dilatation with bougies can then alone be relied on, and this can be carried out more easily and more surely from below than from above. In such cases the operation *à deux temps* has an established and unassailable position in surgery.

In examining the table of cases we find that the operation *à deux temps*, when a gastric fistula is formed as a preliminary, has been performed thirteen times, while Loreta's method has been carried out eight times. It is evident, however, that the principle which guided the operators in the selection of the method had nothing to do with the nature of the stricture. It appears to be a question of nationality. Loreta's method was employed in the seven Italian cases and in my case. In France, Germany, and America the operation *à deux temps* has been invariably adopted. It is difficult to account for this except by the supposition that there is diminished risk in fixing the stomach into the wound of the abdomen some days previous to opening the stomach itself. I believe, however, Loreta's method will come more and more into use, for the reason that, with proper precautions, the risk of opening the stomach at once can be reduced practically to *nil*, whilst if we form a fistula we must forego certain other very decided advantages to the patient.

In advocating gastrotomy as a method of dealing with œsophageal stricture it should be distinctly understood that we do not suggest it as an alternative to the ordinary method of dealing with these strictures *from above*, such as dilatation, internal or external œsophagotomy, or electrolysis. As long as bougies passed through the mouth can be made to traverse an œsophageal stricture,—that is, as long as the ordinary methods of treatment from above give any hope of a successful issue,—so long the question of gastrotomy does not arise. It is only when the stricture is practically impermeable from above that Loreta's method, or one of its modifications, becomes a necessity to save the patient from starvation, or from the short-lived misery of a permanent fistula in the stomach, through which he must be fed until nature requires sustenance no longer. It is noteworthy how frequently a fistula which seems to be impervious when tested by bougies passed through the mouth admits with comparative ease the bougie passed upward from the stomach. In the case I have reported it was only after prolonged efforts and after many trials that I succeeded in getting a bougie through the stricture from above, and when it was once withdrawn I could not get another

one in, and yet at the operation an Otis dilator passed through the stricture almost at the first attempt. Other operators have recorded the same experience; and the reason for it is easily understood. From the frequent efforts to take food, continued for months, it may be for years, the œsophagus above the stricture has become so greatly dilated as almost to form a large pouch. Somewhere at the bottom of this pouch there exists a small opening through which the liquid portion of the food can trickle.

The wonder, then, is that a bougie, probing about the floor of this well, strikes as frequently as it does the aperture and passes through it. This aperture may be so small or situated at one side in such a position that it cannot be found. The condition of the œsophagus at the other side of the stricture is quite different. Here there is no such pouch. On the contrary, the œsophagus is generally contracted by disuse and forms more or less of a funnel, so that a bougie passed from below is, as it were, guided to the stricture; and thus it happens that such an obstruction, which was quite intractable to treatment from above, can, with comparative ease, be dealt with from below.

But even when a gastric fistula has been established it may not be possible to pass a bougie through the fistula into the œsophagus and through the stricture without further assistance. An ingenious method of dealing with such cases was suggested by Hagenbach in 1889.[1] A small shot is fastened to the end of a long thread and then the shot is swallowed. Or a hollow bougie open at both ends is passed down to the stricture and the threaded shot passed through it to the stricture and the bougie withdrawn. The patient then is directed to swallow water, and by its aid the shot is carried through the stricture and appears inside the stomach. It is then caught and drawn out through the fistulous opening in the stomach. A strong silk thread is now fastened to this, and, by means of the end hanging out of the mouth, is drawn up through the stricture. We thus have a strong silk thread passing through the mouth, the œsophagus, and the stomach, the ends of which hang one out of the mouth, the

[1] Correspondenzblatt Schweizer Aerzte, 1889, No. 5.

other out of the gastric fistula. Both ends are then tied together. Every day a bougie is tied to the gastric end of the thread, and is drawn upward through the stricture, which can thus be rapidly dilated. The thread is not finally removed until the stricture is sufficiently dilated to allow of bougies being passed with facility without its assistance. Five cases are recorded in the tables as having been treated by this method. In one of these, Case 13, increasing sizes of violin-strings were substituted for the bougies at first. In Case 15, F. Lange succeeded in passing the threads by means of a fine whalebone bougie passed from above. To the gastric end of the thread he fastened a set of small blades, devised by himself, and then by traction on the other end of the thread coming out at the mouth he drew these blades into the œsophagus and thus performed internal œsophagotomy from below. The gastric fistula was closed on the eighteenth day. Five months later, as the stricture had begun to recontract, he performed internal œsophagotomy again, but this time the incising instrument was passed down from the mouth.

Case 19 shows yet another method of dealing with the stricture with the assistance of a gastric fistula. In this case, Abbe, of New York,[1] first opened the œsophagus near the root of the neck, and then he established a gastric fistula. He then succeeded in passing a very fine conical gum-elastic bougie upward through the stricture. To the end of this bougie he tied a piece of strong braided silk and drew it through the canal. By pulling this string up and down in a seesaw manner over the distended stricture these tissues were gradually and rapidly divided, so that enlarging bougies were quickly able to pass with ease until the normal calibre of the œsophagus was restored. He proposes to call this method the "string" method. The patient was exhibited at the New York Surgical Society four months later, when the result was seen to be all that could be desired.

Electrolysis was the means employed in Case 10 by Hjart, and proved eminently successful. A sound was pushed up the œsophagus from the stomach, its extremity being an electrode; the other electrode was placed on the neck. The internal elec-

[1] ANNALS OF SURGERY, 1893, Vol. XVII, p. 489.

trode was kept pressing against the stricture. The constant current was kept in action for an hour, after which the electrode passed suddenly and with ease up through the stricture.

Such are the chief modifications which have been suggested for what is sometimes called retrograde dilatation of œsophageal strictures. I think the record of cases which I have been enabled to lay before you is most encouraging.

In advocating this method of treatment, we do not propose an operation which is to drive from the field old and well-tried methods of dealing with these cases. We propose a plan, new, it is true, which promises to bring speedy relief to a class of cases which we have been accustomed to look upon as desperate and beyond the pale of the surgeon's art. That they are not so has now been proved; and those cases which in the future are rescued from starvation and its attendant miseries, as many have been within the past few years, will owe their lives, not so much to him who performs the operation, as to the master mind who devised it,—to Loreta, of Bologna,—who has again taught us that there is no finality in surgery.

Œsophageal Stricture Treated by Gastrotomy and Retrograde Dilatation.

No.	Operator.	Where Published.	Age.	Sex.	Duration of Symptoms.	Cause.	Method of Treating Stricture.	Treatment of Stomach Wound.	Result.	Remarks.
1	Loreta. 1883.	Reported by T. Holmes, Brit. Med. Journal, Feb., 1885.	24	M.	11 months.	Swallowing caustic alkali.	Immediate dilatation.	Stomach wound closed and organ returned to abdomen.	R.	In 18 days.
2	Loreta.	Ibid.	26	F.	8 years.	Idiopathic.	"	"	R.	In 20 days.
3	"	Ibid.	21	F.	. . . . .	. . . . .	"	"	R.	
4	"	Ibid.	. .	. .	. . . . .	. . . . .	"	"	R.	No details.
5	Catani (Florence).	Ibid.	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .	R.	No details. Seen in perfect health 7 months later by Prof. Loreta.
6	Frattina (Brescia).	Ibid.	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .	R.	No details.
7	Bergmann.	Berlin. klinische Wochenschrift, 1883, p. 685.	. .	. .	. . . . .	Caustic potash.	Sponge-tent passed from below.	Gastric fistula formed.	R.	Fistula healed in 1 month.
8	Lenattan.	Centralblatt für Chir., 1884.	12	F.	. . . . .	Sulphuric acid.	Dilatation with pharyngeal forceps from below.	Gastric fistula.	R.	Fistula closed in 3 months.
9	Caponotto.	Centralblatt für Chir., 1885, p. 446.	5	F.	. . . . .	"	"Olives" drawn up from below, following rod of a Verneuil's dilator.	"	R.	Fistula closed in 1 month. Death 7 months later from tubercular meningitis.
10	Hjart.	Centralblatt für Chir., 1886, p. 69.	14	F.	. . . . .	Caustic potash.	Electrolysis from below.	"	R.	Fistula closed in 4 months.

ŒSOPHAGEAL STRICTURE TREATED BY GASTROTOMY AND RETROGRADE DILATATION.—Continued.

No.	Operator.	Where Published.	Age.	Sex.	Duration of Symptoms.	Cause.	Method of Treating Stricture.	Treatment of Stomach Wound.	Result.	Remarks.
11	Maydl.	Wiener med. Zeitung, 1886, p. 287.	22	M.	. . . . .	Caustic soda.	Hagenbach's method. Conical bougies drawn upward.	Gastric fistula.	R.	Gastric fistula not closed at time of publication.
12	Soldani.	Centralblatt für Chir., 1887, p. 787.	24	M.	. . . . .	Sulphuric acid.	Hagenbach's method.	"	R.	Two months later patient improved; but still under treatment.
13	Socin.	Schweizer Korrespondenzblatt, 1889.	8½	F.	. . . . .	"	Hagenbach's method. Increasing sizes of violin strings drawn upward through stricture; each string remaining *in situ* for about two hours.	"	. .	No result given.
14	Spannoche.	Raccoglitore Med. Foclè, 1890, X, 297.	. .	. .	. . . . .	. . . . .	Immediate dilatation.	Stomach wound closed and organ returned.	R.	
15	F. Lange.	New York Med. Journal, 1890, LI, p. 131.	4	. .	2 years.	Concentrated lye.	Internal œsophagotomy from below. Blades drawn up by a thread passed by means of a whalebone bougie passed from above.	Gastric fistula.	R.	Fistula closed on eighteenth day. Internal œsophagotomy per oram 5 months later.

ŒSOPHAGEAL STRICTURE TREATED BY GASTROTOMY AND RETROGRADE DILATATION.—Concluded.

No.	Operator.	Where Published.	Age.	Sex.	Duration of Symptoms.	Cause.	Method of Treating Stricture.	Treatment of Stomach Wound.	Result.	Remarks.
16	Terrillon.	Progrès Médical, 1890, XI, 244.	58	M.	Many years.	Idiopathic.	Gradual dilatation.	Gastric fistula.	R.	Fistula open 15 months later, but patient otherwise well.
17	A. Dixon.	New York Med. Record, 1891, XL, 549.	54	M.	. . . . .	"	Gradual dilatation 24 days after gastrostomy, first by bougies, then by uterine dilator.	"	R.	Two months later re-contraction. Digital exploration through fistula revealed the cardia to be seat of malignant growth.
18	Kraske (Freiburg).	Beiträge zur klinische Chir., Vol. VIII, 1892, p. 109.	. .	. .	. . . . .	Injury caused by passing a stomach-pump.	Hagenbach's method.	"	R.	Fistula closed 4 months later.
19	R. Abbe.	New York Med. Record, Feb. 25, 1893.	. .	F.	. . . . .	. . . . .	Abbe's "String" method.	Combined gastrostomy and œsophagostomy.	R.	Œsophageal fistula closed spontaneously in 2 weeks. Gastric fistula closed by plastic operation after 8 weeks.
20	Giesler.	Bruns. Beiträge zur klin. Chir., Bd. VIII.	. .	. .	. . . . .	Idiopathic.	Hagenbach's method, with olive-pointed bougies.	Gastric fistula.	R.	Two months later fistula closed.
21	Kendal Franks.	Present Communication.	24	F.	17 years.	Scarlatina.	Immediate dilatation with Otis's dilator.	Stomach closed at once and returned.	R.	Well 18 months after.

DISLOCATION OF THE HUMERUS COMPLICATED BY FRACTURE AT OR NEAR THE SURGICAL NECK, WITH A NEW METHOD OF REDUCTION.[1]

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THE injury which is the subject of this paper has received careful study from numerous observers since a very early period, and the attention bestowed upon it has been much greater than I was at all aware of until, with the invaluable aid of Dr. Charles N. Dowd, I was able to study its history. It is interesting to note that so long ago as fifty years before Christ Pasicrates[2] described the injury, recommending reduction of the dislocation first, and treatment of the fracture afterwards, and Aristion, Heliodorus, Paul of Egina, Guy of Chauliac, and others, all recognized the importance of the injury and the difficulties encountered in its management. In 1839, Sir Astley Cooper,[3] who was fortunate enough to meet with three cases, when reporting them, says, "Every intelligent, well-informed surgeon will now confess that no knowledge or exertion of skill could have prevented the deformity and loss of the natural motion which results from this formidable accident."

This statement is certainly not supported by subsequent

[1] Read before the New York Surgical Society, January 10, 1894.

[2] Malgaigne, Journal of Surgery, 1853, p. 81.

[3] Guy's Hosp. Reports, IV, p. 277.

history, for, owing to fortunate ease of reduction, a number of cases have been successfully treated.

In 1843, Riberi[1] reported a case which he had treated by passive motion so as to establish a false joint at the point of fracture, the dislocated head of the humerus being left unreduced. The method of treatment made use of in this case is still known by the name of Riberi.

In 1852, Richet[2] read before the Surgical Society of Paris the history of a case of fracture of the neck of the humerus with dislocation of the head, and a very full discussion of the subject followed; and in 1884 appeared the thesis of Oger,[3] in which were collected and compared the records of eighty cases, and many facts in regard to the frequency of the injury, its pathology, and the results which follow it were presented.

A most satisfactory discussion of the subject is to be found in the book on dislocations, by L. A. Stimson;[4] and in the Revue de Chirurgie, 1892, is a very complete paper by Poirier et Mauclaire,[5] in which fracture of the humerus with dislocation of the head is studied at length, and additional cases are given.

The accident is a rare one, for a careful extended search has revealed the records of only 117 cases, and no single observer has met with more than five. Of course, there are many unreported instances.[6]

The cause of the injury has usually been stated as a fall upon the shoulder or a heavy blow received directly upon the same part, while in other reports the patient is said to have fallen upon the outstretched hand or upon the elbow. The exact method by which the injury is produced is hardly capable of demonstration, nor is the statement of the patient of much value, for, as in other injuries, the patient almost invariably believes

[1] Oger, Paris Thesis, 1884.

[2] Mémoires de la Société de Chirurgie, 1853, t. III, pp. 445–468.

[3] Oger, Paris Thesis, 1884.

[4] Stimson, Treatise on Dislocations.

[5] Revue de Chirurgie, October 10, 1892.

[6] In 117 cases, 46 dislocations were stated to be subcoracoid; no location given in 36, and 11 were called axillary. Most of these last two classes were probably subcoracoid; 16 were called subclavicular, 7 subglenoid, and 1 subspinous.

that when he has fallen and injured himself, he has struck upon the part which he finds most seriously damaged.

It seems probable that in the larger number of instances the dislocation is produced by the usual mechanism,—that is, through violent sudden abduction of the arm, as in a fall upon the hand or elbow, and the head of the bone having become fixed in its new situation, that fracture takes place through continued abduction, combined perhaps with forced rotation, the edge of the glenoid cavity or of the acromion acting as a fulcrum. The complication has also been produced a good many times by the surgeon in his efforts to reduce a simple dislocation. The dislocation has been usually subcoracoid, occasionally subglenoid, and very rarely subspinous.

The line of fracture has been varied. In some cases it had passed accurately through the anatomical neck, but in much the larger number the fracture has been of the surgical neck, either transverse or obliquely upward through the tuberosities or obliquely downward through the shaft.[1] In most cases the lower fragment, that continuous with the shaft, has been found lying on the outer side of the upper fragment, and more or less drawn upward and towards the glenoid cavity.

The diagnosis is not always easy, swelling of the soft parts about the shoulder increasing the difficulty. If the absence of the head of the bone from the glenoid cavity, and its presence at another point can be determined, the diagnosis of dislocation is of course clear. Usually the mobility of the shaft of the humerus, and the readiness with which it falls close to the side of the thorax, would prove the presence of fracture, the existence of dislocation of the head having been determined, but, as has been pointed out by Stimson,[2] the same mobility may exist in a case of dislocation without fracture, provided the capsule of the joint has been sufficiently lacerated. The most important diagnostic

[1] The fracture in 117 cases was in 69 at the surgical neck; in 27 at the anatomical neck; at the "neck" in 11; both anatomical and surgical necks were fractured in 6 cases; 1 case was comminuted, and the "upper part" of the humerus was fractured in 3.

[2] Treatise on Dislocations. Stimson, p. 255.

features, which were clear in the case I report, are the presence of the head of the bone in an unnatural position, and its failure to move when free rotation of the arm is made.

Shortening of the limb and crepitus may or may not be capable of definition. A careful examination, with the aid of anæsthesia, will hardly fail to result in a definite diagnosis, provided that the injury is not too old, and that union between the fragments has not occurred.

The treatment of this injury has always excited interest and has given rise from time to time to much discussion, for the condition of a patient who has suffered both fracture and dislocation is much worse than that of one who has received only one of the two lesions. When both injuries exist at once, the difficulties of making reduction of the dislocation, and of properly treating the fracture, and the liability to vicious union are much increased, and there is no prospect that after union has occurred, free and painless use of the arm can ever be made with the head of the bone out of place.

For many years, and particularly since the introduction of anæsthesia has rendered the feasibility of the reduction of all dislocations greater, surgeons have been agreed that, whenever fracture and dislocation of the same bone has occurred, the dislocation should first be reduced if possible. This is clearly the proper practice, for not only do the difficulties of the reduction of a dislocation constantly increase with its age, but also the treatment of the fracture, while the dislocation is unreduced is certain to be imperfect on account of the malposition of the upper fragment, and the displacement and tension of muscle and other tissues. Therefore, in a very large proportion of the cases on record attempts at reduction of the dislocation were made, sometimes with success, oftener with failure. Sir Astley Cooper believed that if reduction was to be effected at all it would probably be with the aid of extension and with the heel or knee in the axilla. But it is evident that, when the humerus is fractured near the head, to make use of extension with the heel in the axilla is both a useless and dangerous procedure. This method depends for its value upon the integrity of the bone,

so that the extending force may be conveyed to the head, and the shaft of the bone be also used as a lever.

As suggested by Stimson,[1] *gentle* traction in the proper direction may be useful, "for the periosteal connection may be sufficient to make it practicable thereby to bring the upper fragment into a more favorable position." With this exception, methods of reduction depending upon traction on the shaft and rotation of the same part are out of place and dangerous. The active method of reduction, recommended by almost all writers of modern times, and which has been not unfrequently successful, and always harmless, is that of direct manipulation of the head of the bone into place by pressure with the thumb and fingers. When anæsthesia is made use of, the situation of the head of the bone being favorable, and the laceration of the capsule of the joint sufficiently great, this method of direct impulsion of the head may succeed, and should always be tried. In eighty cases, of which the records in regard to method of treatment are sufficiently accurate for reference, attempts at reduction were made within a reasonably short period. Direct pressure upon the dislocated head of the humerus was the method usually employed. In thirty-six cases reduction was accomplished, and in forty-four cases all efforts failed.

In six of these cases more or less violent and repeated efforts, by means of traction, rotation, etc., resulted in death.[2]

The difficulty in making reduction is, of course, due to the small size of the upper fragment, the existence of the fracture destroying one's power to control the movements of the head of the bone by means of the shaft. It is to a means of overcoming this difficulty that I shall ask your attention in connection with the case which I report.

Failing to make immediate reduction of the dislocation, some surgeons have depended upon the old method, which consists in treating the fracture until firm union has occurred, and then, using the repaired shaft for extension, rotation, or leverage, en-

[1] Treatise on Dislocations. Stimson, p. 256.

[2] Oger, Paris Thesis, 1884. Poirier et Mauclaire, Revue de Chirurgie, October 10, 1892.

deavoring to reduce the dislocation. This method has but little to recommend it. In the first place, union may fail to occur at all, in which case the difficulty in making reduction will be very much increased by the lapse of time, in fact, reduction will very probably have become impossible. Secondly, owing to the malposition of the upper fragment, union will be very likely to be imperfect or vicious, and even if firm union occurs, it is likely to give way under the vigorous manipulations necessary to reduce a dislocation, already six to eight weeks old, before the attempt is made. This method has been made use of in ten cases. These have all been reported by Oger,[1] and a careful search through subsequent literature has failed to reveal other records. In seven of these cases, persistent, often violent and repeated, efforts failed to accomplish reduction. Three of the ten are reported as having been successful, but a reference to the original reports shows that one of the three (Warren's) escaped from observation after three days; a second (Langenbeck's) is noted as a successful reduction by apparatus, eleven weeks after the original injury, and the third (Baroni's) is reported as having been successfully treated about sixteen days after the injury, "without breaking the fragments apart."

Complete failure to effect primary reduction, and the very proper rejection of the second plan, which has just been referred to, leaves one still the choice between two different methods.

To avoid the usual greater disability and pain accompanying an unreduced dislocation, one might select the method of treatment known as that of Riberi, which consists in attempting, by passive movements, made from the beginning, to establish a false joint. In suitable cases, where the fracture has taken place at a high point, and the lower fragment has been raised by muscular contraction outside of the upper one, and near to the glenoid cavity, this method may meet with success,—that is, continued passive motion may establish a neärthrosis between the lower fragment and the glenoid cavity, so that a moderate amount of movement of the upper arm may result. Reports as to the exact condition obtained by this method are singularly wanting.

[1] Oger, Paris Thesis, 1884.

Seven cases are reported as having been treated by Riberi's plan, either without attempt at reduction or after such attempt had failed. At the end of periods varying from six months to four years, these patients were reported as "having use of the arm," being "able to carry the hand to the head," etc. No account is given as to the pain or disability caused by the dislocated head of the bone.

The suggestion of this method by Riberi was due, doubtless, partly to the recognition of the difficulty of making reduction, and partly to the fear, well grounded at that time, of anything in the nature of operative interference. But when one considers that the presence of the head of the bone in an unnatural situation has usually been the source of great discomfort, and even of severe pain and serious disability, one might well hesitate to adopt a plan uncertain to succeed at all in accomplishing its object of establishing a false joint, painful and protracted in its application and imperfect in its final result. At the present time, I think the surgeon should apply the method only to such cases as present positive contraindications (such as age, debility, or complicating injuries), to more radical treatment, or to such patients as positively refuse operative interference.

But there still remain to be considered those cases where reduction of the dislocation has failed, and where no contraindication exists to the making of further effort to better their condition.

Shall an attempt at reduction by open arthrotomy be immediately made, with subsequent treatment of the fracture? or shall one select the simpler operation of resection of the head of the bone, and so render almost certain the formation of a painless, and often useful, false joint?

These questions cannot be answered dogmatically, nor are there such statistics bearing upon the point as to warrant the laying down of definite rules of treatment. The reduction of the dislocation, even if open arthrotomy is required, is certainly the most attractive method, for it offers the prospect of a more nearly perfect final result than the other plan.

In a recent injury the obstacle to reduction would be,

almost certainly, the limited opening in the capsule of the joint. The glenoid cavity would be fresh and free from the new-formed tissue, which renders the reduction of old dislocations by open arthrotomy so difficult, and sometimes impossible, and the operation of enlarging the rent in the capsule would not be especially difficult or dangerous. If the dislocation were reduced, suture of the fractured bone-ends would naturally be made at once. If union failed to occur, the head of the bone would be in the most favorable position possible. If reduction even by arthrotomy failed, the head of the bone should certainly be resected at once, as its continued presence out of place would be a very probable source of danger and discomfort, and would complicate the treatment of the wound.

Reasons existing for not performing the operation of open arthrotomy and reduction of the head, resection of the latter might well be left for subsequent consideration, and then after all acute symptoms had subsided be resorted to in case sufficient pain or disability existed to call for this secondary operation.

At least six cases of open operation can be referred to (Nos. 112, 113, 114, 115, 116, 117), in every one of which the head was, either primarily or secondarily, removed.

Author's Case.

On the evening of June 17, 1893, a gentleman, aged forty-five, tall and of heavy build, jumped from his carriage, the horses of which had become unmanageable, and fell, striking probably upon his right hand. He arose with difficulty, and found that his right arm was disabled. His family physician, Dr. F. H. Rankin, of Newport, R. I., visited him within an hour, and, with the aid of ether, made a careful examination. Dr. Rankin recognized a dislocation of the head of the humerus, complicated by a fracture at or near the surgical neck of the same bone. He made vigorous and prolonged efforts to reduce the dislocation without success. On the following day two experienced surgeons were summoned in consultation; the diagnosis of the nature of the injury which had been made by Dr. Rankin was confirmed by them, and about thirty-six hours after the accident had occurred ether was again administered and prolonged efforts by manipulation, extension, and otherwise, were made to reduce the dis-

location. All attempts to accomplish reduction failed, and, after consultation, it was agreed that further effort was useless and perhaps dangerous, and that the wisest course was to treat the fracture with a view of obtaining union, and after union had occurred to again attempt reduction of the dislocation. The arm and shoulder were therefore encased in a well-padded wire-netting gutter-splint, and the whole bandaged securely to the thorax. During the following week the patient was comfortable, suffering but little pain, and moved about his room with ease. On June 26, nine days after the injury, I visited the patient for the first time in consultation with Dr. F. H. Rankin and Dr. C. B. Porter. Ether was again administered to allow of a thorough examination of the injury. But little swelling existed. Complete flattening of the shoulder and marked prominence of the acromion were noted. The arm was placed without resistance against the side of the thorax. The head of the humerus could be distinctly felt beneath the coracoid process, where it seemed to be very firmly fixed. Rotation of the shaft of the humerus was easily made; but this movement imparted no motion to the head of the bone. It was clear that fracture existed, and further examination also showed that the line of fracture was very oblique, running from a point very near the head downward and outward to a point about three and one-half inches from the acromion. As fracture existed, it would have been, of course, futile and even dangerous to use the shaft of the humerus and the forearm in attempting to reduce the head by manipulation, and extension applied through the parts below the fracture could not be expected to affect the head of the bone above the fracture. The portion of shaft which remained attached to the head was far too small to be seized with the fingers and made use of as a lever in attempting reduction by any method, and vigorous attempts to dislodge the head of the humerus by acting directly upon it met with absolute failure. I was entirely satisfied, as were also Drs. Porter and Rankin, that the dislocation could not be reduced by any method as yet proposed unaided by operation. The plan of treating the fracture and then after union had occurred attempting reduction did not seem satisfactory. In the first place, there was no *certainty* that union would occur. Then at the end of five or six weeks, if union were strong enough to justify an attempt at reduction, the difficulties would be very much increased, and liability to refracture should be considered. Lastly, the history of the method, with only three successes against seven failures, was not encouraging. The

method of abandoning reduction and attempting to form a false joint between the upper end of the shaft and the glenoid cavity promised at first a very imperfect result. To both of these methods arthrotomy with immediate reduction was to be preferred, but this was a grave operation, which, while it has resulted well in a few cases and has the endorsement of high surgical authorities, can possibly never give a *perfect* functional result. I therefore proposed the following plan, which I had had in mind for about a year in the event of meeting with a suitable case: An incision should be made through the soft parts on the outer aspect of the upper fragment down to the bone, a hole drilled in the bone, a stout hook inserted, and direct traction

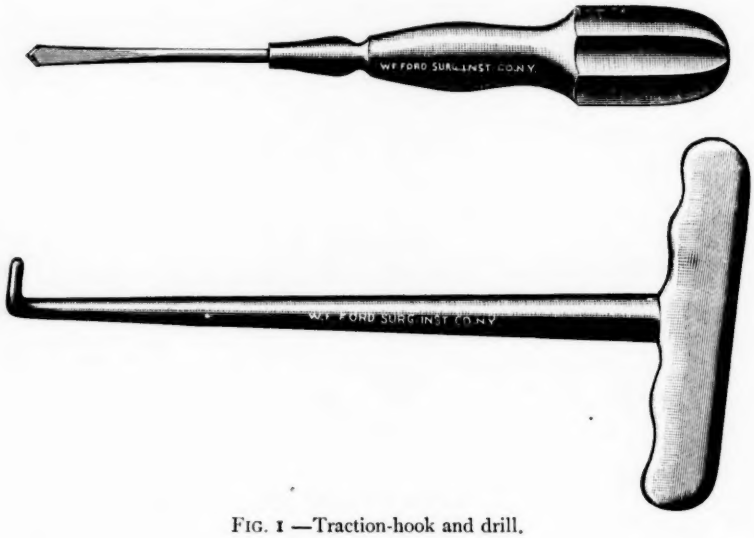

FIG. 1 —Traction-hook and drill.

made upon the upper fragment in the proper direction. The proposition was assented to, and the patient came to New York a few days later to have the attempt made. The operation was done on July 1, 1893, two weeks after the original injury, in the presence of Dr. W. M. Polk, and with the assistance of Drs. F. W. Murray and H. W. Taylor. In the few days intervening after my first examination of the patient I had made a suitable drill (Fig. 1), and also a blunt right-angled hook, the blunt end of which corresponded exactly to the size of the drill. An incision about one and one-half inches long was now made, being about one inch below the acromion. This

incision was carried through the deltoid muscle to the outer surface of the upper fragment. With the drill a hole was then made which passed completely through the very obliquely-bevelled bone. The hook was inserted as far as it would go. Dr. Murray then slowly carried the forearm and upper arm outward and nearly to a right angle with the body, and, with the powerful hook in the right hand and the fingers of the left hand on the head of the humerus, I made vigorous traction in the same direction. The effort required was very considerable, but no change in direction was needed, and reduction was accomplished at the first attempt. Examination through the wound then revealed some interesting features. The absence of crepitus had been noted before, and was now explained. While the dislocation existed the upper fragment projected laterally at a far greater angle than could be well appreciated through the thick deltoid. Consequently the fragments were never in apposition, and to have

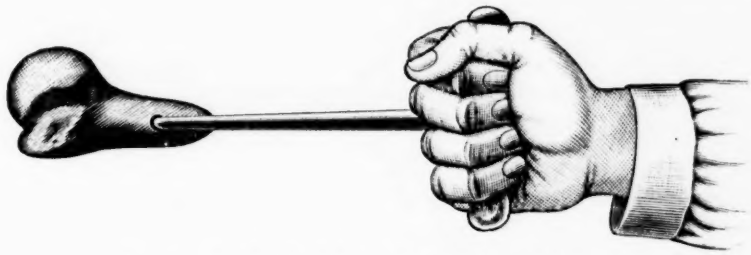

FIG. 2.—Traction-hook inserted into dislocated fragment.

brought the fracture-surfaces together it would have been necessary to carry the elbow away from the body to a distance of from eight to ten inches. Before doing the operation I had expected to suture the fragments together with heavy catgut, but after the reduction of the dislocation was accomplished I found the apposition of the fragments to be so very perfect that I made use of only two deep catgut sutures, passed through the soft parts immediately overlying the bone. The arm could now be brought close against the side of the thorax without displacing the fragments. The wound was closed throughout with catgut, without drainage, a sterile dressing was applied, and the whole shoulder, upper arm, and forearm enveloped in a plaster-of-Paris case. Not the slightest interruption to health followed the operation, and after a week in bed the patient was able to walk about, using a sling to support the heavy splint. On the tenth day the splint

was removed and the wound examined. Primary union had occurred throughout, and a fresh plaster splint was applied. On the twenty-fourth day the second splint was removed. Quite firm union of the fragments was noted, and moderate passive movements of the shoulder-joint were made. A much lighter splint was then applied, the fore-arm being left exposed, only supported by sling. From the fifth week on passive movements of the shoulder and massage of this joint were made every day or two until the end of the seventh week, when the patient was able to return to his home in the country without apparatus of any kind, union of the fracture being completely firm, and voluntary movements of the shoulder-joint being satisfactory. Massage and passive motions were kept up, and the arm was very freely used. The patient was examined by me on October 26, and the functional results found to be perfect. The voluntary and passive movements of the right arm were as good as those of the left, and no atrophy of muscle existed, and no deformity at the point of fracture. At about the same time the patient was examined by Dr. W. M. Polk and by Dr. L. A. Stimson, the former declaring the result to be absolutely perfect, the latter detecting a slight restraint when the right arm was carried upward and outward to the extreme point. The patient claims that his use of arm is as good as before the injury.

While the skilful, though unsuccessful, efforts that had been made by experienced surgeons to effect reduction in this case, and my own observations as well, justify me in believing that reduction could not have been accomplished by any of the non-operative methods heretofore proposed, yet I should hesitate to present the plan which succeeded so well in this instance as of universal application. What it offers, however, is a means of harmlessly applying force in the right direction to the dislocated head whenever fracture takes place at or near the surgical neck, or so high in the shaft as to render manipulation of the upper fragment very difficult. What all observers have noted has been the difficulty of applying any more force than could be exerted with fingers and thumbs to the small upper fragment. Of course, the upper fragment could be seized after exposure through an incision with powerful forceps, but the crushing of bone that would necessarily accompany any attempt to make strong traction would prove a

serious objection. I would also suggest the plan which I have described as applicable to those cases where, in an attempt to reduce a simple dislocation, the humerus has been broken at or near the surgical neck. When this accident has happened, the usual practice has been to regard reduction as hopeless, and to simply treat the case as one of fracture. The result in such cases has been great disability and often very serious pain. To escape these conditions, numerous modern surgeons have proposed excision of the dislocated head and the establishment of a false joint. With the instrument which was used in the case just reported a large amount of force can be applied to the dislocated head of the bone in any desired direction, and although extreme force is not usually required in the reduction of dislocations, yet the effort demanded is often very considerable. With the aid of Dr. George Huntington, professor of Anatomy at the College of Physicians and Surgeons, I have made some experiments to test the resistance of the fresh humerus to force applied in the manner described. A fresh humerus was sawed through about three inches below the tuberosities. This was suspended by wire wound about its neck from the ceiling. The hook was inserted in a hole drilled in the outer surface of the bone and various weights were applied. A weight of 175 pounds was borne without in the slightest degree enlarging the opening or fracturing its edge. A very considerable amount of force can be applied with the same instrument in making rotation of the fragment, but the exact amount that can be used without splitting the bone I am not able to state. It has occurred to me that the instrument might be useful in some cases of old dislocation of the humerus in applying counter-extension to the scapula. We all know how movable that bone is, and how difficult it is to properly make counter-extension by means of any contrivance when much traction is made upon the arm. The base of the spine of the scapula—that is, the curved margin which connects the acromion process and the neck of the scapula—is formed by a quite thick and strong mass of bone admirably arranged by shape and direction of fibre to resist force applied nearly in the direction of the upper border of the spine. Throughout a distance of from

two to three centimetres the mass of bone forming the base of the spine of the scapula is quite thick enough to permit the use of the same drill and instrument that were used on the humerus. Measuring from the tip of the acromion process backward along its dorsum, the drill can be safely entered at a point situated from five to five and a quarter centimetres posterior to the tip.

I applied the same test to the scapula that had been applied

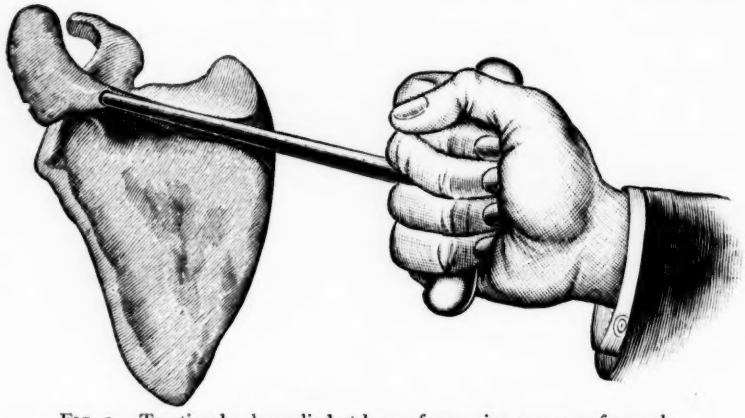

FIG. 3.—Traction-hook applied at base of acromion process of scapula.

to the humerus. The fresh scapula was suspended by its neck, the hook inserted at the point mentioned, and various weights attached. A weight of 175 pounds was borne without the slightest injury to the bone. This is a considerably greater force than can be applied in the form of traction by the average individual, unless with the aid of pulleys, and when pulleys are used all reasonable control of the force is lost.

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TWO CASES OF PRIMARY INTESTINAL RESECTION FOR GANGRENE OF BOWEL FROM STRANGULATION.

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IT is important at the present time that all cases of intestinal resection from strangulated hernia should be recorded, whether they be successful or not. For the operation as a primary measure of treatment is on its trial. Some surgeons think that it will have its day, and that then we shall return to the old operation of artificial anus and an early secondary resection. He would be a rash man who made any dogmatic assertion on this point. In the mean time let us record our experiences, and time will show which is the better treatment. Operations long ago discarded are now again revived under modern conditions of asepticism, and with success. This is apparent throughout the whole range of surgery. Primary intestinal resection was done by Sir Astley Cooper, as has recently been shown by Sir Wm. MacCormac, in his Bradshaw Lecture.[1] But the operation had to be given up on account of the failure to obtain union and the invariable onset of peritonitis. At the present day union of the two ends is nearly always successfully accomplished, and peritonitis is not often directly caused by the operation. But still there is a high rate of mortality, chiefly from shock. The cases so far recorded of failure, and there should be many more if all were made public, show that the mortality is largely due to shock from the depressing nature of the original lesion and an operation which cannot be done in five minutes. Some of the cases recorded or alluded to at meetings show that the bowel has given

[1] Lancet, December 16, 1893, p. 1490.

way, some days after operation, at a distance from the site of reunion which has remained sound. This undoubtedly means that the bowel distended above the actual seat of strangulation was not sufficiently sound to maintain its vitality after its return to the abdominal cavity. A wider resection is the answer at once made to meet this danger. But those who have seen many of these cases will be aware that at least twelve inches may be in this doubtful condition and require resection, if this rule were always followed, when the part actually engaged in the constriction is perhaps not more than an inch or two. To deal with a mesentery twelve inches in length will materially add to the shock, and thereby increase the risks attendant upon the worst danger, after gangrene of bowel, with which we have to meet.

Other cases of primary resection have been followed by obstruction, either from kinking at the seat of reunion, or from stricture, by folding in too much of the intestinal wall in the application of the sutures. Failure of union after suturing in damaged bowel, paralysis, and peritonitis apart from ulceration, have also to be reckoned with. Altogether, the operation of primary resection for strangulated hernia in a patient suffering from collapse has to be considered as a highly dangerous procedure, only to be countenanced by its success in actual practice; and success must be shown to be obtained more frequently by primary resection in an equal and a large number of cases than after an artificial anus and a secondary resection.

But it is possible that a third course may be the best where extreme collapse contraindicates a primary resection,—namely, an artificial anus as immediate treatment to be followed by secondary resection, at an interval of a few days instead of some weeks or months.

Some may think this third course a distinction without a difference; but it is desirable that a very marked distinction should be drawn between what is ordinarily understood as a secondary resection and what is here proposed. A secondary resection is generally undertaken after some weeks' interval, when the bowel

beyond the area absolutely engaged in the constriction has had time to return to its normal condition. Meanwhile it may have contracted adhesions in a difficult position (see post-mortem Case I), the two ends no longer correspond in size, and the patient, perhaps, has not improved much, from the artificial anus being high up in the alimentary tract. The operation may thus be much more difficult and exhausting, whilst the patient is not sufficiently improved to pass easily through such measures as are necessary for success. If, on the other hand, secondary resection is undertaken in a few days after the first operation, adhesions will not be so troublesome, the doubtful area to excise will be defined, the two ends of bowel will more readily fit, and the patient better able than at the first operation to stand what is necessary to be done. In some cases it might be desirable to remove all the damaged bowel at the first operation,—*i.e.*, do a very wide excision, and having brought the two ends with the mesentery up into the wound complete the operation in a few days by reunion of the divided intestine.

Of the two cases now recorded, one died from exhaustion six days after operation, whilst the second recovered after three intestinal operations, and nearly three months' treatment.

Case I.—Miss E., aged twenty-eight, had had a hernia for four years, but had never worn a truss. She had always been able to return it herself when it came down till six days before her admission into St. Thomas's Hospital, on April 15, 1893. On this occasion, when she failed to return the rupture, she had the usual signs of strangulation. Her doctor on being called in attempted reduction, and thought that he had succeeded. She continued, however, to vomit as before, and had no action of bowels. On the third day reduction was again thought to have been effected, but the other symptoms continued. On admission she had stercoraceous vomiting and was in a very feeble condition. In the right groin and in the position of a femoral hernia was an inflammatory swelling tense, fluctuating, and resonant on percussion. The skin looked as if it would shortly give way from suppuration beneath.

Operation.—She was at once placed under the influence of an anæsthetic and an incision made. Stinking pus and gas were evacu-

ated, and a loop of small intestine found protruding from the femoral ring. Nearly the whole of this loop was gangrenous and the rest covered with adherent lymph. It was over three inches in length, and could not possibly have been reunited after excision and then passed through the femoral ring, as the puckered mesentery of so much intestine would have been too bulky, even if the opening had been enlarged by a free division of Poupart's ligament. The loop was therefore drawn down, and, after a ligature had been tied round at each end, the damaged bowel was excised. After thorough disinfection and removal of sac an incision was made through the linea alba and the two ligatured ends of bowel withdrawn on to the surface of the abdomen. The proximal end, which was much distended, was allowed to discharge its contents into a porringer. It was then clear that at least a foot more of this end of the intestine should be excised, if absolute safety was to be secured from subsequent perforation. This was felt to be impossible in the precarious condition of the patient, as the mesentery of so long a portion of bowel would of itself take a long time to treat; a wedge-shaped piece of mesentery corresponding to the absent bowel was therefore excised and the two ends of the intestine shortened as far as the temporary ligatures. The bowel was then reunited by two rows of silk sutures,—the first only for the mucous membrane, whilst the second was employed by the Lembert method for the peritoneal and muscular coats. A glass drainage-tube was inserted and the wounds closed in the ordinary manner. There was no sickness at any time after operation, and the temperature remained normal. The discharge from the drainage-tube was offensive the day after operation, and on the 20th became distinctly fæcal. At the same time there was an evacuation of some fluid per rectum. She died on the 21st, six days after the operation, without any abdominal distention or any sign of peritonitis, but from simple want of rallying power.

Post-mortem by the late Dr. Hadden. No peritonitis; suturing of bowel perfectly sound; intestine some distance above the line of suture presented a small round aperture from ulceration. This coil was deeply placed in the pelvis with a localized track leading to the surface where the drainage-tube had been placed. As the aperture did not involve more than a small portion of the calibre of the bowel, there is no reason why it should not have spontaneously closed.

So far the post-mortem record is satisfactory,—that the

return of damaged bowel did not cause peritonitis and the line of suturing had remained sound.

From the fact that she died at the end of six days from simple exhaustion and without post-mortem evidence of peritonitis, I think we may conclude that the removal of an additional foot of intestine would have caused her death more certainly and at an earlier date.

Case II was one in which primary resection was done after four days' strangulation, and at the end of seventeen days an artificial anus was made on account of obstruction from kinking. And, again, after the lapse of another eighteen days the artificial aperture was closed by a third operation.

Mrs. S., aged thirty-two, was sent to me by Dr. Creighton, and admitted into St. Thomas's Home on September 30, 1893. She had had a right femoral hernia for eight years, but had never worn a truss. The hernia came down on the 27th, with symptoms of strangulation, pain, vomiting, etc. Taxis was employed unsuccessfully by Dr. Creighton, but, although repeatedly urged, she declined all operative interference till the day of her admission into the Home. The femoral hernia was hard and tense, but without any external evidence of inflammation. Her temperature was 101.4°, and she was collapsed and very feeble. The operation was at once commenced, and the sac opened. Adherent omentum was found, and behind this a knuckle of small intestine, which was dark, but with a good polished surface. The narrow neck of hernia was incised, and the loop of small intestine gently pulled down. A rush of fæcal fluid was at once seen to escape from an ulcerated opening at the seat of constriction. There were two deep grooves, at the bottom of which the bowel wall was obviously very thin. After disinfection the omentum was removed and the ligatured stump returned. The opening into the abdomen was still further enlarged and more bowel withdrawn. The area involved by the two deep grooves, in one of which the opening existed, was then seen to be about one and a half inches in length. Beyond this the damaged bowel extended so far that it appeared to me to be unsafe to remove it in her collapsed condition; for if more than one and a half inches were removed, then at least a foot should also be removed, for there was no choice between these two extremes. I thought, also, that the one and a half inches could be excised, sutured, and returned

through the enlarged femoral ring, whereas the larger operation would involve the addition of an abdominal section, and the treatment of a large mass of mesentery.

The portion already described as one and a half inches in length was therefore excised close to the mesenteric attachment and the mesentery doubled on itself, and kept in position by a few silk sutures. The two ends of small intestine were united by a double row of silk sutures, one for the mucous membrane and the other for the peritoneal and muscular coats, after Lembert's method.

After the completion of the operation there was a good deal of difficulty in returning the bowel into the abdomen. It required a free division of Poupart's ligament before this could be satisfactorily accomplished, and even then there must have been a good deal of strain by pressure on the sutures. The sac was then excised, and a drainage-tube passed up just within the abdomen.

She vomited twice in the twelve hours succeeding operation; but not again till the sixteenth day, when other signs of obstruction made their appearance. She was fed by nutrient enemata for the first three days, but on October 4 was fed by the mouth, and subsequently took fluid nourishment freely. On the 5th the bowels acted after an enema, and continued to do so till the 16th. The temperature rose to 102° F. the day following the operation, and after this varied from 98° to 100° F. There was no abdominal distention till the 14th, when this symptom began to make its appearance. The bowels then also began to act less readily with enemata, and on the 16th she was sick. On the 17th she was again sick, and the abdomen was much more distended. She had had no action of the bowels for two days. I came, therefore, to the reluctant conclusion that she had obstruction from some cause connected with the seat of operation. The wound had given no trouble nor cause for anxiety, and at this time was discharging very little.

October 17, 3.30 P.M. The abdomen was opened in the mid-line, a little free fluid was found, but no pus, and no general adhesions. One distended coil of small intestine led directly down to the femoral ring, where it was firmly adherent. At this spot the bowel felt thickened, and the part beyond collapsed and empty. I feared, therefore, that my suturing had produced stenosis. The distended coil was therefore opened and the contents evacuated. On passing my finger down the inside of opened bowel I found that opposite the

femoral ring there was no real reduction from the normal calibre of the intestine, but that the apparent thickening was due to kinking. At any rate, if this was the spot sutured, there could not be, to my mind, enough contraction to cause symptoms. The opening that I had made in the bowel was attached to the abdominal incision in the ordinary way for an artificial anus as a temporary safety-valve.

After this operation she had no vomiting, nor did she suffer from much pain. The abdomen did not again become distended. But the temperature for the first five days varied between 100° and 103° F., and then became almost normal. There was a very large flow of fæcal fluid from the artificial opening, which rapidly made the skin very sore. She had had a very troublesome cough, which had been present from the first, but now became very much worse. This increased the difficulty of controlling the fæcal discharge, which I had hoped would gradually diminish as the opening contracted. Throughout November pad-strapping and bandage were fairly successful in controlling the discharge; but the cough sometimes defeated all our efforts. The bowels always acted by enema during the whole of the time.

December 4.—As the opening still remained, and she had had no further symptoms of obstruction, an operation was undertaken for the purpose of closing the fistulous aperture. In dissecting round the fistula, in the hope of obtaining enough material for the sutures without opening the peritoneal cavity, it soon became apparent that this would be impossible. The abdominal cavity was therefore quickly opened and the loop of bowel withdrawn. A double row of silk sutures was applied, one for the mucous membrane and the second for the peritoneal and muscular coats, after Lembert's method. A piece of omentum from the transverse colon was then wrapped round the line of sutures and attached to the mesentery. The omentum was not set free from its base, as it was felt that there were too many adhesions around to make this a matter of importance. One more adhesion, where all could not be separated, seemed to me rather an advantage, as the mass would be more likely to move as a whole.

She had no symptoms worthy of record after this,—the third operation. There was no vomiting and no distention; the temperature was scarcely raised above the normal standard; the cough rapidly improved, and the expectoration, which had before been profuse, soon became insignificant. She rapidly put on flesh, and was out of bed on December 21, and went home on December 30.

Since the above was written, Mr. H. W. Page has recorded[1] a successful case of secondary resection on the eleventh day. Even in this short time there was a marked difference in the two ends of the intestine. It is noticeable, also, that four inches of bowel were excised, the two ends united, and returned through the enlarged femoral ring, no abdominal section being made. Mr. Page was apparently anxious to do his secondary resection earlier than he actually did. This seems to me the direction in which we should now work, for I am sure many cases die from the prolonged operation necessary for a primary resection in a patient suffering from collapse. The ordinary secondary resection has such grave disadvantages, which have been alluded to above, that surgeons have at all hazards performed primary resection in cases where there was little hope of the patient surviving from the shock of operation. Let the second stage of the resection —namely, its reunion—be accomplished between the fifth and seventh day, and results may *possibly* show a marked improvement.

[1] Lancet, January 13, 1894, p. 90.

TAPPING OF THE LATERAL VENTRICLES.

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THE interesting train of symptoms, long known and recognized, of which the principal are nystagmus, general convulsions, disturbance of the respiration, slowness of the pulse, vomiting, coma, and death, find a solution in the acceptance of the theory of compromise of brain-function by so-called intracranial compression. Whether an actual elevation of intracranial pressure be present, or whether the symptoms have their foundation in irritation of brain-elements by increased transudation, concerns us less than the possibility of restoring brain-function in part or in whole by removing collections of cerebro-spinal fluid, blood, pus, or foreign matter. That this can be done practically upon the operating-table with the same gratifying results as in the experimental laboratory has become a well-known fact. It is, therefore, not strange that operators should have adopted means of reaching compressing agents in the lateral ventricles there known to exist.

Tapping for hydrocephalus through the fontanelle is so old a procedure that it cannot be determined who first devised or practised it. The publishing of the method for tapping the ventricles by means of trephining is of more recent date, and the plans for the same have been technically perfected and shown to be thoroughly feasible and easy of accomplishment.

Dr. C. Wernicke[1] writes of meningitis that the disease can "get well by spontaneous retrogression." It is, therefore, often necessary to lengthen life in every possible manner in order to give sufficient time that the chance of spontaneous retrogression

[1] Lehrbuch der Gehirn Krankheiten, Vol. III, 1881.

may obtain. It seems, in many cases, the cause of death is an effusion into the ventricles, which has the tendency to increase even when the disease is in the stage of retrogression. This can be clinically determined where the fontanelles are still open. Where this condition of things is plainly pronounced, operative interference is fully justifiable,—the more so, as without it a fatal ending can, with the greatest certainty, be predicted. In such cases one will trephine and puncture the lateral ventricles. The returning powerful pulsation of the brain will indicate if the intended result of the operation has come to pass. Where it is necessary there must be no timidity about repeating the operation, or eventually performing it on both sides.

D. Lowson, M.D., of Hull, on April 10, 1885, before a branch of the British Medical Association, read a paper, in which he recounts a case of hydrocephalus in a boy, seven years of age, paralyzed, blind, in constant pain, affected with occasional epilepsy, but intellect unimpaired. The skull was drilled, fluid aspirated, and constant drain established by means of silver cannula, to the end of which rubber tubing was attached, leading under carbolic acid fluid in a bottle placed lower than the head. Rapid improvement with some movement of limbs and some vision was noted. In his sleep patient pulled out the cannula twice. The last time it could not be found. Died comatose the day after, the eighth after operation. Silver cannula found in the ventricle.

Dr. Philip Zehner, of Cincinnati, in a paper on tumors of the brain, read before the Academy of Medicine, February 1, 1886, referred to tapping the ventricles as a palliative measure in some cases of tumors of the cerebellum, and reports a case in which the proposition to do the operation was circumvented by sudden death of the patient. The autopsy of the case made clear the certain benefit to be derived from such interference.

Ernst von Bergmann,[1] writing of the operative treatment of acute hydrocephalus from tubercular meningitis, states that "it is not the deposit of miliary nodules along the course of the vessels which causes the danger, but rather the inflammation of the plexus and its products,—the acute effusion of fluid into the

[1] Die Chirurgische Behandlung von Hirn Krankheiten.

brain cavities. The intracranial pressure, through increase of ventricular cerebro-spinal fluid, becomes so great that it offers a hinderance and at last an actual obstruction to the entrance and progress of the blood. Naturally comes the thought to drain off the water, and thereby unburden and free the circulation."

Von Bergmann then describes the similarity of the deposit of miliary tubercle on the pia and peritoneum, both followed by great transudation. The well-known and remarkable results following emptying of the peritoneal cavity with retrogression of the tubercular process lead him to think that the same benefit might accrue in puncturing and draining the ventricles. It was this reasoning that led him to operate, July 15, 1888, upon a case of tubercular meningitis in the stage of brain paralysis.

"The patient lay in a deep stupor, with periods of restlessness and groaning. Pulse 72 and intermittent. Respiration of the Cheyne-Stokes character, with very long intervals. In the contracted left arm convulsions. Eyes closed, pupils dilated, and without reaction. Immediately after the operation, pulse 104, regular; respiration 40 and regular. Evening of same day patient takes nourishment; the eyes are opened, pupils less dilated, and react against light. The patient died, yet the benefit to be derived from the operation was illustrated in a most striking manner."

Dr. W. W. Keen, of Philadelphia, has perhaps done more than any other in bringing the operation into prominence. His achievements have been entirely original, independent of the accomplishments of operators who have antedated his work.

As he states in the paper published in the *Medical Record* of September 20, 1890, he was led, November 7, 1888, to propose the trephining, puncturing, and draining of the lateral ventricles, by the results shown at the autopsy of a case of tubercular meningitis, which had been trephined for supposed abscess, a drainage-tube had been introduced and found post-mortem to reach within one-fourth inch of the distended ventricle, the same having produced no inflammation or irritation.

Dr. Keen reports three cases of his own upon which he did the proposed operation. The first for threatened blindness from acute hydrocephalus, due to tumor of the cerebellum. The left side was first trephined and drained, and some twenty days afterwards the right

side; irrigation of the ventricles, from side to side, without ill result, was demonstrated in this case. This patient died, the post-mortem revealing a sarcoma of the left lobe of the cerebellum.

The second case was one of hydrocephalus of about three years' standing, the mental condition being poor. The left ventricle was tapped, improving paresis of right arm. Convulsions set in next day, thought to be due to too rapid emptying of ventricle. It was decided to replace the fluid, which being done, had the result of stopping convulsions; this was repeated eight times, each time stopping convulsions. The autopsy revealed extensive hydrocephalic distention.

The third case was one of unilateral acute internal hydrocephalus of left ventricle. The patient, being in extremis, died four hours after operation.

Dr. Samuel Ayres, on December 4, 1888, operated upon an imbecile child, five years old, disease beginning during third month of life with convulsions. Enlarged head with closed fontanelles and sutures, aphasia, total blindness, idiotic smiling, rotary movement of head, and grinding of teeth, bowel and bladder incontinence. Had never walked or stood alone. Trephining over coronal suture one and a half inches to right of median line, distinct pulsation, fine trocar introduced through dura downward, backward, and inward to a depth of two and a half inches. One ounce of fluid removed from ventricle, and small quantity from space between dura and brain. Oozing of fluid for several days from puncture in dura. Pulse before operation 120 to 140, after operation, 140; temperature 101.8°. Child could stand alone two or three days after. Partial restoration of sight, would wink on finger being passed before eyes. In three weeks was gradually able to walk alone across room, less irritable, and could sleep well; no development of speech; no control of sphincters. Three months after operation continued improvement.

Dr. Keen reports two cases by Dr. Mayo Robson, of Leeds. The first of these, a boy of ten years, with high temperature, right hemiplegia and aphasia, twitching of limbs of right side, double optic neuritis; operated February 7, 1889, one-and-a-half-inch trephine used over motor centres of right side; no pus being found, a needle was pushed into lateral ventricle, and ten drachms of clear liquid evacuated. Patient showed continual improvement; six months later was in good health. The second case was that of an infant with acute hydrocephalus, drainage and relief to patient, which, however, died the third day after from convulsions.

A. Broca,[1] surgeon to the Hospital of Paris, published two cases under the head of "Drainage of the Ventricles for Hydrocephalus," one of his own, the other by Thiriar, of Brussels. His own case was one of hydrocephalus with contracture of left arm. Drainage of right ventricle, contracture of arm disappeared, object of operation was consequently reached.

Thiriar's was a case of hydrocephalus of three years' standing. Tapping was followed by diminution to circumference of head and a depression of fontanelle. Patient died. Autopsy showed great distention of ventricles.

To these I will add two cases within my own experience.

CASE I.—March 8, 1891, at about 3 P.M., Charles K., a hod-carrier, was struck upon the head by several bricks falling from the second story of a building. He is said to have been completely unconscious immediately after the hurt, gradually regaining partial consciousness; could make efforts at answering questions, and move his limbs. The disability being deemed of a passing nature, he was placed on some boards in the engine room of the building, upon which he had been at work. At five o'clock P.M., two hours after injury, there was so little improvement shown that he was taken to his home, where a physician advised removal to a hospital. He arrived at St. Elizabeth Hospital at 9 P.M, and was placed in my service.

House-surgeon, Dr. Palmer, made note of the following: Still dressed in working clothes, a well-developed, muscular man lay without motion on the table. Pulse 30 to 40, full and irregular; respiration 8 to 10 per minute, irregular and somewhat stertorous. Upon questioning him loudly, he mutters unintelligibly. Pupils dilated, respond feebly to light, and on holding light closely the lids are shut tightly; seems to have good motion on right, diminution in motor power on left side. Owing to great amount of effusion into scalp no definite diagnosis of fracture could be made. Several contusions with great swelling above and in front of right ear.

Upon reaching the patient, the paresis of left side was so marked that it was decided to trephine over right motor centres. After the head was prepared in the usual way, a U-shaped flap beginning at the frontal eminence running backward in median line four inches and returning anteriorly to ear, the flap being about two and a half inches

[1] Revue de Chirurgie.

wide. Previous to this, a row of interlocked alternate white and black sutures, about a quarter inch outside line of incision, were tied to control the hæmorrhage. The flap separated from the skull was wrapped in gauze and laid upon the forehead, exposing a linear fracture, commencing a half inch to right of sagittal and the same distance posterior to the coronal sutures, involving the latter suture as far as the incision permitted observation. A one-and-a-half-inch trephine was so placed that the anterior margin reached the coronal suture, and superiorly within a half inch of sagittal suture, and a button of bone removed. No epidural clot or hæmorrhage, but great bulging of the dura, of exceedingly tense feeling and without pulsation. A meningeal artery crossing the trephine opening was tied, and it made the base of a flap in the dura. The brain-substance protruded beyond the skull opening about a quarter inch, and with difficulty replaced. At the moment of bulging pulse and respiration became more rapid; when pressed back pulse and respiration were slower. No subdural clot or hæmorrhage as far as the finger could explore, a normal amount of cerebral fluid escaped. On account of the above conditions a hydrops ventriculi was diagnosticated, and tapping of the ventricles decided upon.

No trocar being on hand, an aspirating-needle, corresponding to No. 3 American catheter scale, was used with syringe attached. The direction of introduction was slightly backward and towards the median line. At a depth of two and a half inches fluid was reached, the syringe was detached from needle, and about three ounces of ventricular fluid gradually drained off. No anæsthetic was given the patient after the incision through the scalp. After the drainage of the ventricle the respirations increased to 16 and pulse to 120 per minute. There was a general reaction, the pupils became smaller, paresis was improved, and the patient was much more sensitive to pain, chloroform being necessary in the latter stages of the operation. No further drainage was employed than a few strands of wicking, which were passed from the point of brain-puncture to the most dependent part of dural and skin-flaps. The button of bone, which had been kept in sterilized water at a temperature of 100° F., was replaced and the scalp brought together with deep, interrupted, and superficial, continued sutures and an aseptic dressing applied. The operation lasted one and three-quarter hours. The following morning respiration was 18 and pulse 120 per minute, temperature 102° F. Patient was comatose, defecated and urinated unconsciously. At 5 o'clock P.M., twenty-six hours after injury and nineteen hours after

operation, temperature rose to 105°, and patient died suddenly, with no marked change in pulse and respiration up to that time.

At post-mortem the dressings were found dry, save slight oozing; edges of scalp united; the pericranium adherent to button of bone; button adherent to dura, and edges of dura united. Upon removal of skull-cap a linear fracture was revealed, beginning as above indicated and extending along the coronal to the sphenoid bone, where it divided into several smaller fractures in the sphenoid and temporal bones. On removal of brain from cranial cavity an epidural clot was found under the squamous portion of temporal bone, there was also a similar sized clot beneath right cerebellar lobe, which lobe was softened to a noticeable degree. The brain and meninges were much congested. The ventricles were empty, and no trace of puncture was found. That the tapping was justifiable was shown by the improvement immediately afterwards. There was sufficient traumatism to cause death. The rise in temperature was ascribed to the extended fractures, disorganization of cerebellar tissue, and resorption of blood clot.

CASE II.—Freddie McC., aged thirteen, was referred to me by Dr. Brower, to whom I am greatly indebted. The following history was gleaned: Parents respectively forty-two and forty-three years old; in good health; tubercular, specific, or malignant family taint denied. Mother has had but two children,—the patient and a girl aged ten, who is bright, active, and well developed.

Until the age of six years the patient was apparently well, though precocious, attended school, learned quickly and easily, and was apt at acquiring vices and the use of profane language. In disposition he was combative, and was admired by all who knew him for being clever and cute beyond his years.

The history of present trouble began when in sixth year, and extends over a period of several years. At that time he fell from a wagon, striking upon the back of his head. Nothing was thought of the fall, since the patient was at play soon after. He did not become unconscious, nor was there a sign of external injury nor any complaint of resulting pains. Two weeks after he became sick with a fever, which lasted two weeks, was delirious, head was thrown back, and patient at times lay in an opisthotonos position. Intense jaundice developed, the duration of which is unknown. During entire illness there was no incontinence. Convalescence was slow, and during its period of three months patient was fretful and peevish, would cry out in pain, while grasping the head with both hands. He had delusions of varied character, and spoke disconnectedly. In the third month

after beginning of disease patient began to stammer in his speech, and had disordered and involuntary muscular movements and twitchings of face, trunk, and limbs. These increased to the extent that the child was unable to walk or stand, and received many hard blows from falls in consequence. A physician declared it to be chorea. In about one year the patient gained sufficient strength to walk fairly well, but became subject to epileptoid seizures. As when walking or standing the patient would fall and be unconscious for a moment, without convulsive movements; would, however, immediately get up and pursue the subject of occupation. These continued about one year, and were followed by spells during which patient seemed unconscious, the countenance staring, face flushed, followed by pallor. Patient had an ataxic walk, ascending stairs with great difficulty, and was sleepless. The application of faradic current improved both. The power of speech was lost gradually to the extent that only single words could be articulated,—mamma, papa, the name of his little sister, and a few profane words. He was irritable, and would laugh and cry without apparent cause. He was sent to school for a short time, but was unable to acquire anything. There was at the time incontinence of urine and fæces, but at the present time indicates the calls of nature.

The boy is well developed and muscular, thirty-two inches in height, without pubic or axillary hair, which is unusual for a child of that age. The reflexes were found to be normal, except exaggerated knee jerk. The walk is spastic; can walk alone but a few steps. Unilateral symptoms were present, the right side affected more than the left. Has habit of chewing right thumb, upon which callus has formed. Pupils are widely dilated and do not react to light. A critical examination of them cannot be made on account of the restlessness of the subject. Patient has occasional rise in temperature and vomiting. Pulse irregular, from 60 to 70; respiration, 14 to 18, irregular and sighing.

Diagnosis.—Idiocy following hydrops of the ventricles, in turn due to chronic inflammation of the ventricular lining, as a result of cerebro-spinal meningitis. It was proposed to tap the ventricles. After due consideration it was accepted by the parents, to whom the dangers and uncertain results had been explained.

The operation was done May 4, at 11 o'clock A.M., Drs. Luken, Beck, Holland, and McKay being present, besides the house staff. Keen's posterior route for reaching the ventricles was selected, and it was decided to do it upon the left side. The alternate white and black

interlocked hæmostatic sutures were used. A U-shape flap was made and separated from skull, wrapped in gauze, and laid to one side. With a one-and-a-half-inch trephine there was removed a button of bone, the anterior margin one-half inch posterior to coronal suture, the upper margin one and a half inches from sagittal sutures. The button was kept in sterilized water at a temperature of 100° F. The dura opened, a trocar, size No. 3 American catheter scale, was introduced almost directly downward, slightly forward, to base of skull. The ventricle was reached at a depth of one and a quarter to one and a half inches, as was shown by the outpour of clear ventrical fluid, of which six or seven ounces escaped. A grating feel upon the trocar gave the impression that there might be present a ventricular calculus. In order to explore the cavity the handle of a scalpel was passed alongside the trocar, a pair of closed forceps were introduced through the opening then made without being able to detect anything unusual. The index finger was next inserted into the ventricle with no better result. It is, however, noteworthy that this can be done with safety; also that while the finger was in the brain there was great depression, weak and slow pulse and respiration, which improved upon withdrawal. A drainage-tube one quarter of an inch in diameter was passed into the ventricle and through the posterior part of wound. The ventricular fluid flowed freely and with distinct pulsation. The dura was sutured with catgut and button of bone replaced, the scalp coapted and a sterilized dressing applied. Time of operation was two hours. Before removal from the table there was noted a paralysis of right side which persisted until death. The pupil of right eye smaller than left. Patient placed in bed lay very quietly. Passed urine involuntarily, but indicated to his mother when his bowels were to move. He recognized both his father and mother.

On day of operation at 5 P.M., pulse 100; respiration variable and irregular, between 40 and 50; temperature 102° in axilla.

8 P.M., pulse 120; respiration variable and irregular, between 44 and 55; temperature 102° in axilla.

May 5, 8 A.M., pulse 100; respiration variable and irregular, 40; temperature 101.5° in axilla.

3.30 P.M., pulse weak, could not be counted; respiration 56; temperature 100° in axilla.

At 8 P.M. patient was brought to dressing-room to have a new dressing applied, the old being saturated with ventricular fluid. Upon exposure the wound was found in good condition. The edge of the scalp united. The drainage-tube was freely movable, and discharged

clear fluid with distinct pulsation. The external wound was cleansed and dressing applied. Patient seemed more comfortable. At 11.30 P.M. died quietly without convulsions.

Post-mortem was held the morning of the 6th of May. The body was rigid, and the toes of the right foot were extended; the corneæ of both eyes were opaque.

The dressing was removed, and no signs of sepsis were visible here or in any part of the wound. The sutures in the scalp were cut, and slight union was found throughout. There was also slight union between pericranium and cranium, also between cranium and button. Button was adherent to the dura. One catgut suture in the dura had loosened itself. The edges of dura were united, and there was no sign of hernia of the brain. During the entire examination there was a free flow of ventricular fluid.

The cranium was very thick, the button of bone being five-eighths inches in depth. The cranial sutures were raised above the surrounding bone.

The following pathological and anatomical description of brain and meninges was kindly furnished me by Dr. Beck, of this city. The dura mater is much thickened; the inner side is smooth. The inner membranes are nowhere adherent and are easily removed. On the left side of the skull, about four centimetres from the median line and in front of the coronal suture,—in fact, entering it,—is an oblique opening in the skull, about two centimetres in diameter; this was traversed by a band of solid connective tissue, which is united to the pericranium on the outside and the dura internally.

The convolutions of the brain are narrow, especially in the parietal and occipital lobes, some of them being only three and four millimetres broad, but the sulci deep. The convolutions are more ramified than usual, so that the normal configuration of the gyri and sulci is disordered. The island of Reil on both sides is softened, and does not show any distinct gyri. The brain case is normal as regards the array of vessels and nerves.

The gray substance of the brain is very narrow.

Both lateral ventricles, as well as the third, are enlarged to double their normal space. The ependyma shows the most remarkable change, the surface has the appearance of so-called chagrin. The cerebellum is disproportionately large to the cerebrum.

The microscopical examination of a part of tissue taken from the lateral ventricle, where the chagrin tissue is most developed, shows the following from within out. The ependyma is thickened and

undulating; under this is a dense layer of connective tissue, and beneath this a zone of infiltrated leucocytes, both of which are characteristic of a chronic inflammation. The brain-tissue is normal.

Might add that the convolutions along the fissure of Rolando, on the left side, are very much lacking, as can be seen in the specimen. The pathological diagnosis is as follows: A partially-defective cranium, micro-gyri, and a chronic internal hydrocephalus.

To continue the history of the operation, I will add the following:

Dr. W. C. Dugan, before the Louisville Surgical Society, on December 12, 1892, reports the interesting case of a lady, fifty years old, having steadily-increasing great pain in head for eight to ten months. Hearing at first slightly, latterly completely lost. Impairment of intellect, slowness of comprehension and in giving answers. Partial paralysis of right leg, incomplete loss of sensation in right arm, twitching of right side of face. Had two convulsions, whether uni- or bilateral unknown. Ocular examination reveals double-choked disk.

Diagnosis of tumor was made. Probable seat upper part of fissure of Rolando.

Exploratory operation over left parietal region, button of bone removed, allowing dura to bulge greatly, of singularly hard and inelastic feel. The dura opened, brain-tissue welled up as thick as the finger and impossible to return. Hypodermic needle found no fluid, but on grooved director being passed into ventricle three or more ounces of fluid escaped. As the fluid drained off, the brain-tissue receded, and, when completed, the finger could be passed easily between dura and cortex. No tumor was discovered. The grooved director was passed through septum into opposite ventricle without finding fluid. Without drainage the patient was dressed and put to bed. Reacted well without shock. Headache, paralysis, and loss of sensation relieved immediately. Hearing has not returned. As the exact pathology of the accumulation of fluid was not understood, it was thought that the tapping or aspiration may have to be repeated; on that account the button of bone was not replaced.

Dr. Theodore Diller reports a case operated upon by Dr. R. W. Stewart for supposed tumor at base of brain, after an injury two years previous. Diffuse headache, drowsiness, left hemiparesis, cerebellar

titubation, dysphagia, aphonia, and advanced optic neuritis. Operation to relieve intracranial pressure, find and remove tumor if possible. No tumor or depression of bone found, but great bulging and formidable protrusion of brain indicated intracranial pressure. The ventricle was tapped and two ounces of clear fluid removed; drainage. Left paresis more marked after operation, and four or five convulsive seizures. Patient died thirty-six hours afterwards. Tumor, a sarcoma, about the size of a walnut on left side of pons found at post-mortem.

Verified by the results of dissections and trials upon the cadaver, the method of reaching the ventricles has been described in so lucid a manner by W. W. Keen that little can be added to his article published in the *Medical News*, of December 1, 1888. Three routes,—anterior, lateral, and posterior—are given with the minutest details. To this paper I would refer those interested.

In a general way where there is a point of election for reaching the ventricles, either of Keen's routes will make the attainment of the object easy. However, they should not be considered to be the only manner of finding them, nor is it necessary to have recourse to them when the skull has been opened in a different place by injury or disease. From any point on the cerebral cortex it is not very difficult to penetrate to the normal ventricle, familiarity with its location and conformation being the principal requirement. It is extremely easy when the cavity has been enlarged, as in chronic hydrocephalus.

At the post-mortem of Zenner's case, a trial puncture with a trocar three-quarters of an inch to the side of the median line and about one inch anterior to the line connecting the auditory orifices succeeded in reaching fluid at a depth of one and a half inches beyond the dura, but the operator succeeded equally well at several points posterior to this. Broca made a cross incision through the pericranium and trephined three centimetres above and three centimetres behind the right ear meatus, and introduced the trocar in the direction of the opposite ear meatus. He felt the brain consistence yield at a distance of four centimetres, a discharge of clear fluid following.

Thiriar, by experiments on the cadaver, establishes the rule to trephine seven and a half centimetres above the meatus auditorius externus and one centimetre anterior to this line. These

varied rules prove the truth of my previous assertion, that from different points on the cerebral cortex it is not difficult to reach the ventricles.

After the usual aseptic or antiseptic details of preparing the head, a straight crucial or curved incision involving a flap may be made to expose the cranium. A chisel, drill, or trephine, large or small, may be used; if the opening be too small it can be enlarged with proper instruments. The dura may be simply punctured with the trocar, or a dural flap may be made to expose the cerebral surface. This latter has the advantage of allowing of closer observation of the cortex and of finger-exploration between cortex and dura.

The instrument to be used for the puncture is optional with the operator, and the depth to which it will be necessary to penetrate will depend on the amount of fluid in the ventricles.

Zenner used a trocar and found fluid at a depth of one and a half inches. Von Bergmann used a long exploring-needle and introduced it slowly until cerebro-spinal fluid escaped. Keen, at first, used a grooved director, but later cannula, No. 13, French, and thinks it less liable than any other instrument to do damage, which is principally the puncturing of larger vessels. Mayo Robson used a needle and pushed it onward until fluid began to flow. Broca employed the trocar of a Potain aspirator and came upon fluid at a depth of four centimetres. Thiriar made use of a fine rubber cannula closed by a button, and penetrated to the depth of five to six centimetres. I have, in the one case, used the aspirating needle; in the other a fine trocar cannula, No. 3, American. I have devised a cannula with blunt stylet, which will be a useful instrument. In the one case I have penetrated to a depth of two and a half inches, in the other one and a half inches, depending on the amount of distention of the ventricles.

Now, the very important question of drainage arises. Shall it be rapid and free, or slow and in drops, and shall there be irrigation?

The question must be decided for the individual case, as the requirement for each must necessarily differ, depending on the conditions to be met. If the effusion into the ventricles is the result of acute and still active inflammation, decompression

by rapid removal of fluid and subsequent continuous drainage until the acute stage subsides or repeated tappings without drainage would be the rational procedure. If the inflammation be in the stage of retrogression, the artificial removal of fluid by simple tapping without drainage will be all that is required.

In cerebellar or tumors of other situations, blood-clot from trauma, etc., compressing the circulation to the extent of bringing about a hydrops ventriculi; if the condition be recent, rapid, and continuous; if it be of longer duration, with great amount of fluid, where the brain-tissue is or may be trephined, tapping and slow continuous drainage or repeated tappings would seem to be indicated. In chronic hydrocephalus, with great distention of the ventricles, the brain-tissue being atrophied and greatly altered in physical relationship, in order to allow of gradual return to something approaching normal condition, it is best to both tap and drain slowly. That rapid emptying of the ventricles, under these circumstances, is dangerous and may be fatal is well illustrated by Keen's interesting and highly instructive case, No. 2. Finally, in abscess of brain breaking into the lateral ventricles, the most rapid and free drainage and cleansing irrigations is the only procedure promising relief in that most dangerous condition. In these cases it would be best to trephine and drain both sides and irrigate from side to side. That this can be done is demonstrated by Keen's case, No. 1.

Repeated tappings or aspirations in some cases may advantageously take the place of drainage. The means to secure drainage will be found in rubber tubes of different calibre, gauze, wicking, or horse-hair. In special cases, operative procedure could go further than puncture or drainage, the ventricles may be incised and opened with forceps so that a consistent mass, blood-clot, or foreign body might be removed. In my second case a finger was introduced into the ventricle without any apparent lasting detriment to the patient. This opening up the ventricles freely, probing, and digital examination may be of diagnostic and therapeutic value in special instances.

Although it does not strictly come under the heading of this paper, mention is made of a number of cases of secondary spontaneous opening of the ventricles, from trauma or abscess,

with draining off of cerebro-spinal fluid, for a longer or shorter time. Many of these have recovered, the condition did not add to the gravity of the disease or injury.

Indications.—What is generally understood as brain compression offers the indication for trephining and tapping the ventricles of the brain. That compression can be a sole factor, without other important lesion, in producing death is amply proven by the careful and interesting experiments on animals, and remarkable results obtained by Dr. P. Deucher, published in the *Deutsche Zeitschrift für Chirurgie*, Leipzig, 1892, to which I would refer those interested.

It is true, there is no certain method of differentiating compressing agents in the general cavity, the ventricles, or in both together. One such instance has come under my observation, the compressing fluid being drained from the general cavity. Opening of the dura would determine that, perhaps laminectomy, under these circumstances, would be of equal value with trephining.

The compression symptoms have so often been alluded to in the history of the operation that it will not be necessary to repeat them.

In the cases, so well described by Wernicke, of brain compression from simple or tubercular meningitis, decompression by tapping the ventricles offers reasonable hope of restoring brain-function and maintaining its integrity. The symptomatology points to the fact that compression is often the sole element inducing a fatal termination. It is in these acute cases that the operation is of greatest value and urgently demanded. When the skull has been opened for compression symptoms, which are confirmed by bulging of dura and protrusion of brain, no tumor, clot, or depressed bone being found, it is indicated to tap the ventricles. This was shown in my Case, No. 1; in that of Dr. Dugan and that of Dr. Diller. These, although an unrelievable condition underlay the hydrops ventriculi, received an amelioration of the symptoms, as was well illustrated in Dr. Dugan's case. Abscess of brain, which has invaded the ventricles, it is quite clear, demands immediate tapping, and, if possible, irrigation from side to side. This needs no further elucidation or argument. Possi-

ble benefit may be received by tapping chronic hydrocephalus, where there is but little enlargement of head, symptoms denoting a compression, moderate in extent and severity. This was well illustrated in Ayer's case, in which the compressing agent had been at play for over four years.

In tumors of the brain, involving the circulation to the extent of bringing about hydrops ventriculi, it is advisable to trephine and tap the ventricle, where the compressing agent has added to the suffering or disability of the patient, or is a proximate cause of danger to life.

But in chronic hydrocephalus, with enlargement of head, with great distention of the ventricles and corresponding atrophy of brain-tissue, it is contraindicated to tap and drain. All cases of this class have died from the operation. One can easily comprehend that under these circumstances no benefit can accrue.

The following summary is offered in conclusion: Trephining and tapping the lateral ventricles,—

(1) For distention of the ventricles from acute, simple or tubercular meningitis, is a therapeutic measure clearly indicated, and other things being equal, promises recovery.

(2) For effusion of blood into the ventricles from trauma or disease, makes recovery a possibility.

(3) For abscess, involving the ventricles, is immediately and imperatively demanded.

(4) For effusion into the ventricles, from brain tumors, may afford relief to symptoms.

(5) For chronic hydrocephalus, moderate distention of the ventricles, without enlargement of head, may afford relief.

(6) For chronic hydrocephalus, great distention of ventricles, enlargement of head, will lead to a fatal result.

SPONTANEOUS TORSION OF THE PEDICLE OF OVARIAN TUMORS; WITH THE REPORT OF A CASE OF ROTATED OVARIAN CYST WITH EXTENSIVE INTRA-MURAL HÆMORRHAGE.[1]

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THE accident of torsion of the pedicle of ovarian tumors was first pointed out by Rokitansky[2] in 1841, though it was not till 1865 that the subject attracted any considerable attention.[3] At that time he published a report of thirteen cases, eight of which were met in fifty-eight patients who had died with ovarian tumors. He regarded it as an occurrence of no great rarity, his statistics showing that it occurred in 13 per cent. of ovarian tumors. Schroeder[4] met with thirteen cases among ninety-four ovarian tumors, or 13.8 per cent. Two cases of twisted pedicle were found in a series of twenty-four tumors of the ovary treated in the Methodist Episcopal Hospital during the last six years. Of these I shall speak later. As we meet the condition at the present time, it is considerably rarer than the figures of Rokitansky would show. Thornton explains this by the fact that it is now the rule to operate early upon ovarian tumors, and they are not allowed to go on to rotation. The statistics which he has compiled show the percentage of rotated tumors to be about 9.5 per cent.

As early as 1855, Patruban[5] reported a case of ovarian

[1] Read before the Brooklyn Surgical Society, January 4, 1894.
[2] Rokitansky: Handbuch der Patholog. Anatomie, Vol. I, 1841.
[3] Rokitansky: Zeitschrift der K. K. Gesellschaft der Aerzte in Wien, 1865.
[4] Schroeder: Viet—Archiv für Gynæcologie, 1878.
[5] Patruban: Oesterreichisches Zeitschrift für practische Heilkunde, 1855.

cyst, in which the pedicle became twisted and the patient died of a rapid intra-cystic hæmorrhage.

Edwards[1] reported in 1861 the case of a woman with a cystoma of the right ovary who developed symptoms of rotation on the sixth day after delivery. She went into a state of collapse on the first day, and died on the second day after the accident. The autopsy showed a thin-walled, livid purple tumor, mottled with bloody extravasations. The peritoneal covering was lacerated in three places, one rent being an inch and a half long. From one of these rents protruded a clot. The cyst was distended, with claret-colored fluid.

Peaslee[2] speaks of three cases of ovarian fibroids, larger than the fœtal head, with twisted pedicles. James Crane's case, of which he also speaks, was a multilocular cyst complicating pregnancy. Twenty-four hours before labor commenced the patient had been seized with agonizing pains in the left iliac region. She died of peritonitis five days after delivery. The tumor was found at the autopsy of a dark-purple color, almost black, with several perforations in its walls.

Perry[3] reports the case of a woman with a movable tumor in the left side of the abdomen, who, while walking, was suddenly seized with pain in the left iliac region, and went at once into a state of profound collapse. The tumor was observed to enlarge rapidly during twenty-four hours. After two days the very acute pain and tenderness disappeared. The tumor underwent but little change in size. At the end of a month her condition was better than before the accident.

Wiltshire[4] published a report of a patient who had carried an abdominal tumor for several years, and who, after an unusual exertion, suddenly developed excruciating pain, referred to the tumor, and went into a state of collapse. The tumor rapidly increased in size. The patient was subjected to operation. On puncturing the tumor a gallon of dark blood is described as

[1] Edwards: London Lancet, Vol. II, p. 336, 1861.

[2] Peaslee: Ovarian Tumors, 1872, p. 80.

[3] Perry: American Journ. of Obstetrics, Vol. IV, 1871, p. 454.

[4] Wiltshire: Transactions of the Pathological Soc. of London, Vol. XIX, p. 295.

escaping through the trocar. The pedicle was found to be twisted, and so friable that the body of the uterus had to be transfixed with the ligature in order to control the bleeding.

Barnes[1] has reported two cases of sudden hæmorrhage into the sac of ovarian tumors following twisting of the pedicle. One of the cases complicated pregnancy. The patient died from rupture of the sac and bleeding into the peritoneal cavity.

Seiley,[2] in 1864, reported an important case, in which the woman was seized with the symptoms of shock six days after delivery. She improved gradually for thirteen days, when the symptoms recurred, and she died six days later. The autopsy revealed an ovarian cystoma with a twisted pedicle. The tumor had ruptured and contained thick blood and clots.

A rare accident is reported by Spencer Wells, in his work on "Diseases of the Ovaries," 1873. Two cases have come under his notice, in which the pedicle had become twisted entirely off from its attachment. One of these was a dermoid cyst; the other was a multilocular cystoma. The tumors were nourished by vessels passing through the adhesions to the omentum and intestines. Both tumors were removed, and both patients recovered.

The same author[3] reported to the Obstetrical Society of London the case of a woman in whom pregnancy was complicated by an ovarian tumor. Labor came on at six months. One week after delivery severe pain developed in the tumor, and it rapidly increased in size. Ten days later, while turning over in bed, she screamed that something inside had broken, and died almost instantly. The tumor had totally disappeared.

A case is reported by Klob,[4] in which intestinal obstruction was caused by an ovarian tumor with a twisted pedicle.

In 1880, Mr. Tait[5] read a paper founded upon three cases. The first of these cases he operated upon for hernia. The autopsy showed an ovarian cyst with a twisted pedicle.

[1] Barnes: St. Thomas's Hospital Reports, N. S., Vol. I, pp. 355, 376.
[2] Seiley: Edinburgh Medical Journal, 1864, p. 464.
[3] Spencer Wells: Transactions of the Obstetrical Soc. of London, Vol. XI, p. 254.
[4] Klob: Pathologische Anatomie der Weiblischen Sexual-Organe, Wien, 1864.
[5] Lawson Tait: Diseases of the Ovaries, 1883, p. 294.

Thornton[1] has compiled a table of fifty-seven cases occurring in 600 ovarian tumors. This table shows that torsion of the pedicle of ovarian tumors "is so frequently associated with pregnancy that this condition must be considered a predisposing cause." It also shows that dermoid cysts are especially liable to rotation. In four of the cases there was division of the pedicle and transplantation of the tumor. All four of these cases were dermoids.

A case operated upon by Dr. George R. Fowler,[2] in 1890, at the Methodist Hospital, in Brooklyn, presented a history of several attacks of lesser severity, brought on by washing clothes over a tub. From these the patient had recovered after a few days of rest. Three days before operation she had been seized with great pain in the right iliac region, a tumor had rapidly developed, and she had become greatly depressed. The operation showed a dark maroon-colored, monolocular cyst filled with reddish chocolate-colored fluid, containing much broken-down blood elements. The pedicle of the tumor was twisted three turns. The patient made a good recovery after extirpation of the tumor. It was my fortune to be an assistant at this operation, and I remember that the operator made the diagnosis of twisted pedicle before opening the belly.

Joseph Price,[3] in November, 1893, read a paper in which he reported a case of cysto-sarcoma of the ovary in a young woman of seventeen, which had become strangulated by rotating four turns. The tumor was almost black. He reported another case of cystoma of the ovary, which after strangulation had increased rapidly in size. Both tumors were removed, and both patients recovered.

A. Ross Matheson[4] has observed this condition in a woman sixty-three years of age, whom he found dying of acute intestinal obstruction. A tumor was discernible in the right iliac region where none had been discovered before. She died on the

[1] Thornton: American Journ. of the Med. Sciences, Vol. XCVI, Oct. 1888, p. 357.
[2] Fowler: Brooklyn Med. Journ., Vol. IV, p. 459.
[3] Price: Annals of Gynæcology and Pædiatry, December, 1893, p. 139.
[4] Matheson: Personal communication.

fourth day of the attack, and the autopsy revealed a monolocular cyst of the right ovary, not more than four inches in diameter, containing a clear, serous fluid. The pedicle was twisted one complete turn anteriorly from left to right. A band of adhesions attached the small intestine to the pedicle. In the rotating of the tumor, this band had been so dragged about the pedicle as to strangulate the gut and cause the obstruction, from which the patient died.

The same observer reported the case of a woman who had carried for many years a large abdominal tumor. After some indiscretion in diet, emesis developed. During an attack of vomiting she was suddenly seized with great pain in the region of the tumor. She suffered from acute intestinal obstruction, and at the end of three days died. The autopsy showed a fibro-cystic tumor of the right ovary, weighing twenty-five pounds, which had rotated anteriorly from left to right one complete turn. The tumor was perfectly free from adhesions; and the obstruction seemed to have been caused simply by pressure upon the gut. Dr. Matheson is of the opinion that the vomiting preceded all other symptoms and was the exciting cause of the rotation.[1]

The case reported below, which was sent into the service of Dr. Pilcher at the Methodist Hospital by Dr. Matheson, I operated upon in August, 1893. Because of its certain unique features it is recorded somewhat in full.

Phœbe B., aged thirty-eight, single, dress-maker, five years before was suddenly seized with severe pain in the right iliac region. This persisted for six weeks, necessitating her remaining in bed during all that time. She recovered from this completely and again went to her work. Five weeks before operation she was again prostrated with a similar attack, which lasted ten days. These attacks she described as being of much the same character, coming on without any

[1] This was fifteen years ago. The woman, while carrying the tumor, had visited the leading gynæcologists of Philadelphia, New York and Brooklyn, but could find no one willing at that time to undertake the operation of extirpation of the tumor, which she begged them to undertake. She herself had asked that, after her death, an autopsy be made. Thus it was that Dr. Matheson was able to report this extremely interesting case.

apparent cause while she was pursuing her ordinary work. The chief symptom was the great pain in the right iliac region, which was so severe as to cause profound prostration. Nausea, vomiting, and tympanitic distention of the abdomen were also present. There is no history of tumor having been diagnosed. Four days before admission to the hospital she was seized with another attack, which she described as precisely similar in its onset to the two previous ones, excepting that it had a more definite exciting cause. Some gastric derangement had excited vomiting, and during an attack of emesis the severe right iliac pain had suddenly developed as though a result of the vomiting. In addition to the prostration and pain of this last attack, she was unable to retain any food in the stomach. Her condition at the time of admission to the hospital was one of profound depression. The temperature was but slightly elevated. The pulse-rate was 130, and respiration 30. She was suffering intense pain, chiefly in the right iliac region, but radiating over the whole abdomen. The abdomen was distended and very tense, and exquisitely tender to the touch over its entire extent, but especially on the right side. No gas or fæces had been passed since the onset of the attack. An enema administered on the fourth day had been ineffectual. She was vomiting frequently a brownish-green material, having a slightly fæcal odor. An illy-defined tumor could be made out in the right side of the abdomen. The examination gave rise to so much pain that the symptoms of dulness on percussion and a sense of resistance on palpation had to suffice.

The symptoms of intestinal obstruction were sufficiently marked to justify operative interference, and the patient was anæsthetized. When she was placed on the table, percussion elicited a distinctly tympanitic note over the right iliac region, where but a few minutes before dulness had been discovered. Percussion further towards the median line revealed a dull note where before the anæsthetic had been begun was a distinct tympanitis. I opened the belly in the middle line and discovered a tumor, the surface of which presented much the appearance of a fresh placenta—a livid, dark maroon color, fairly smooth and firm in consistence. The hand swept around the mass showed it to be movable and somewhat larger than a good sized fœtal head.

The uterus was identified and found to be free and of normal size. In order to remove the growth with greater facility it was incised, and about twenty ounces of perfectly clear, straw-colored fluid,

confined under a high degree of pressure, were evacuated. As the tumor collapsed, it was found to have for its pedicle the right Fallopian tube, which was considerably elongated and twisted upon its axis just one complete turn. Immediately on evacuating the cyst and untwisting the pedicle, the condition of the patient improved and gas began to pass out of the distended intestines. A loop of small intestine was found firmly adherent to the uterine end of the tube, and the rotation of the tumor had caused the gut to be dragged partly around the pedicle. This was not discovered till after the evacuation of the fluid and relief of the obstruction. The twist was from left to right, that is, suppose the tumor lying to the right side of the uterus, the anterior surface had rotated downward. The pedicle was ligated with a Staffordshire knot, the mass removed, and the abdomen closed. The patient's bowels moved five times during the following twenty-four hours. The temperature, which immediately after the operation was 103°, steadily declined, and after the second day never reached a point higher than 99.2°. The wound healed primarily, and the patient was discharged on the twenty-ninth day.

The tumor was a monolocular cyst of the ovary. Its wall varied in thickness from 0.4 centimetre to 4 centimetres. The thin areas, which were but a small part of the wall, were intensely congested. The larger part of the wall, however, was greatly thickened, the increase in dimension being due to an extensive hæmorrhagic infiltration, and presented much the feeling and appearance of a fresh placenta. Microscopic examination of sections made through the thickness of the wall showed, externally, a dense layer of fibrous connective tissue covered with peritoneum; internally, a similar layer about one millimetre thick; and between these two, a great area of loose, fibrillar connective tissue, containing within its meshes enormously distended veins, filled with firmly coagulated blood, arteries containing clots, and outside of the vessels, surrounding them on all sides, and making up the chief thickness of the wall, were fibrin and blood in various stages of coagulation. The blood, in many places, completely surrounded and supported the mural vessels, the connective tissue net-work being very delicate, so that the walls of the cyst were practically split, the hæmorrhage being contained between the two divided layers. The remains of ovarian tissue were spread out over the cyst wall for an area of six or ten centimetres in diameter. The ovarian veins and artery all contained firm clots in both the tumor and pedicle.

The peculiar and interesting feature presented by this case is the extensive intra-mural hæmorrhage without a sign of intra-peritoneal or intra-cystic bleeding. After searching the literature, the only mentions of intra-mural hæmorrhage which I have been able to find are in the report of Edwards's case, and in J. Bland Sutton's work on "Surgical Diseases of the Ovaries and Fallopian Tubes." In the former the autopsy showed that the tumor was "of a livid purple color, and there were patches of extravasated blood in its walls, which had given away." Bland Sutton simply gives a passing mention of extravasation of blood into the cyst wall.

In all of these cases there is, of course, more or less hæmorrhagic extravasation; but when this occurs to any considerable degree it seems to take place from the superficial and less-firmly supported vessels which quickly rupture through one or the other surfaces of the cyst wall. In this case the cystic contents were perfectly clear, as well as the small amount of serum in the peritoneal cavity. Yet this hæmorrhage was so sudden and extensive as to make evident a tumor where none had been discovered before.

When we now come to look into the etiology of this condition, it is evident that it is based upon simple mechanical principles. When we think of a freely-movable tumor, attached to the uterus by a slender pedicle, covered with peritoneum, and enviroined by smooth peritoneal surfaces of numerous and changing planes, it is not difficult to conceive how such a tumor might become rotated upon the axis of its pedicle, and how any of the abdominal actions by which the relations of the parts in contact with the tumor are constantly changed, might be the cause of such a rotation. An elongated pedicle, giving the tumor greater freedom to be acted upon by these rotating forces, is, therefore, a predisposing cause. It is possible, however, for the very forces which cause the rotation to also cause an elongation of the pedicle; so that we cannot always say whether the elongated pedicle is a cause or a result.

The contour of the tumor must have an important bearing. Thornton[1] has called attention to the fact that the dermoid

[1] Thornton: The Medical Times and Gazette, 1877, Vol. II, p. 82.

tumors are much more prone to undergo rotation than any other variety of ovarian growths. This is easily explained by the nodular projections on the surface of these tumors, which offer shoulders against which the rotating forces may be exerted. These projections may also act as ratchets, and, becoming engaged with bony prominences, prevent unwinding.

Statistics show that tumors with twisted pedicles are usually of small size, for tumors which have reached any considerable size have adhesions, and have become more or less adapted to the shapes of the surrounding parts. Thirty-six of those appearing in Thornton's table of fifty-seven weighed less than ten pounds; many weighed five pounds or under; and only eight weighed twenty pounds or over.

The repeated filling and emptying of the urinary bladder has been suggested by Klob [1] as a cause of rotation.

The cases of Edwards, Crane, Barnes, Seiley, Wells, and Thornton, mentioned above, show the intimate connection between this condition and pregnancy. An examination of Thornton's tables shows that 16 per cent. of the cases were associated with pregnancy, and that in 5 per cent. of the cases the acute attack followed labor. He is of the opinion that the fœtal movements have an etiological importance.[2] This same author has recorded three cases in which the diminution in the size of the tumor by tapping caused rotation to strangulation.[3] He has also suggested the peristaltic action of the intestines as being of etiological importance.

A case which has been reported by Malins [4] as due to tapping can hardly be put under that head. The patient had suffered from severe pain and tenderness over the tumor, and her general condition was very low. He drew off eight quarts of fluid, the acute symptoms of strangulation disappeared, and her condition became greatly improved. Three weeks later he operated and found a twisted pedicle, and the cyst walls deeply con-

[1] Path. Anat. der Weiblichen Sexual-organe, Wien, 1864.
[2] Thornton: Medical Times and Gazette, 1877, Vol. II. p. 82.
[3] Thornton: Am. Journ. of Med. Sci., Vol. XCVI, p. 357.
[4] Malins: London Lancet, 1877, Vol. I, p. 529.

gested. The tapping had evidently but relieved the tension in an already rotated cyst.

Tait[1] has suggested that the movements of the fæcal mass through the intestines might have something to do with rotation.

The acute onset has been associated with an attack of constipation. The sudden stoppage of menstruation by exposure to cold has also figured as an exciting cause. The changes of position of the tumor caused by respiration, walking, lying, and other ordinary body movements, palpation of the tumor, and ascites, may also be regarded as etiological factors; and Matheson's case and the one which I have reported are traceable to an attack of vomiting.

Sudden strain or change of position and direct violence frequently act as the immediate exciting cause. Finally, there is often no history of exciting cause.

Of course, the pedicle of an ovarian tumor will stand a certain amount of torsion without giving any symptoms. Beyond this, up to a certain point, the symptoms are vague and illy-defined. But a point is reached in the process of torsion, beyond which marked circulatory disturbances must result; and it is the sudden passing of this point that gives rise to the very acute and characteristic symptoms of the disease. First, the venous return is shut off because of the lesser degree of resistance to outside pressure in the walls of the veins. The acute symptoms begin the moment when blood is being pumped into the tumor through the arteries while the compressed veins are unable to return it. As a result of this the tumor suddenly becomes engorged with blood. This causes an extravasation of serum, an overdistention and rupture of the smaller vessels, and a consequent enlargement in the size of the tumor.

In more than half of Thornton's cases the cyst was distended with blood, and in none is it noted that the cystic contents were clear. The blood contained in these cysts varied from bright red, fresh blood, to clots in all stages of coagulation and disintegration. This hæmorrhage may be so severe as to cause death.

[1] Tait: Transactions of the Obstet. Society of London, 1880, Vol. XXXI, p. 86.

Another alarming symptom is that of intestinal obstruction. Klob,[1] in 1864, called attention to this complication; and Spencer Wells[2] has more recently referred to it. It can be accounted for by the sudden increase of pressure upon the intestines due to the enlargement of the tumor. Adhesions may also play an important *rôle*, for in the case which I have reported the small intestine was bound by adhesions to the twisted pedicle. Another cause is found in the fact that a woman suffering from this condition, with the general depression and the severe pain incident to every motion, is disposed to suppress rather than encourage a movement of the bowels. I am also inclined to believe that the obstruction in many of these cases is excited or aggravated by the opium which must be given in large amounts to control the pain.

The chief pain is referred to the pedicle, and is due to pressure upon the ovarian nerves. In severe cases there is pain and tenderness over the whole tumor from the tension and pressure upon the spread-out filaments of ovarian nerves in the wall of the tumor. In some cases the pain radiates over the abdomen and down the thigh. Thornton[3] mentions a case in which the patient had two acute attacks, in both of which the pain was on the left side. Operation performed during the second attack revealed a twist of the pedicle of a tumor of the right ovary.

Other symptoms are those of hæmorrhage associated with the depression due to severe intra-abdominal pain. These symptoms are quickly complicated or supplanted by those of other peritoneal disturbances.

Any sudden attack of prostrating pain in the region of the ovary, especially in a patient who is known to have an ovarian tumor, should lead us to suspect a twisted pedicle. The suspicion would be all the greater should the attack occur in connection with pregnancy. It must always be borne in mind, however, that these attacks may occur in patients whose tumor has never been discovered.

Because of the great tenderness a satisfactory palpation cannot be made; but some observers have been able, by vaginal

[1] Klob: Pathologische Anatomie der Weiblischen Sexual-Organe, Wien, 1864.

[2] Wells: Ovarian and Uterine Tumors, 1882.

[3] Thornton: The Medical Times and Gazette, 1877, Vol. II, p. 82.

examination, to discover the tender, twisted pedicle to one or the other side of the uterus. Rapid increase in the size of the tumor is another important sign.

These symptoms, when occurring in complication with other abdominal disease, may be a source of confusion. For example, Mr. Tait operated upon a case of hernia, which died four or five days later of a rotated ovarian cyst. The result of the autopsy made him believe that the symptoms which he had hoped to relieve by operating on the hernia were not symptoms of the hernia at all, but were due to the twisted pedicle.

Mann, in the *American System of Gynæcology*, speaks of a case in which three complete turns were found in an ovarian pedicle, which had come on so slowly as to give no symptoms. It is a question, in my mind, whether a sudden twist, in which both artery and veins were occluded at the same instant, would not give fewer symptoms than a slow twisting in which the veins were occluded for a considerable length of time before the arterial supply was shut off.

The same author speaks of a case which presented the clinical picture of rotation, in which the symptoms were due to rapid elongation of the pedicle. An ovarian cyst, during pregnancy, had become adherent to the diaphragm and structures high up in the abdomen, and the contraction of the uterus, after delivery, had so dragged upon the pedicle as to give rise to strangulation of the vessels.

The above reports of recurrences and spontaneous relief show that it is possible for the tumor to untwist; in fact, this is not an infrequent outcome. If, however, the venous return remains obstructed, and the patient does not bleed to death, the result must be a coagulation of blood in the veins and also in the arteries supplying the tumor through the pedicle. If there are vascular adhesions to the neighboring structures, even when the circulation through the ovarian vessels is shut off, the tumor may continue to live, as is shown in the two cases of Wells'. But if the tumor is without such adhesions, it then has no circulation and becomes, in a pathological sense, an infarction. The destiny of such a foreign body in the abdomen must vary with a

multitude of circumstances, depending chiefly on the size and the presence or absence of infection. Under ordinary conditions, adhesions would be set up and the body eventually become replaced by a mass of fibrous tissue, as occurs with bits of liver or kidney which have been experimentally introduced into the peritoneal cavity. I have seen a transplanted abdominal tumor the central portion of which had undergone calcareous degeneration.

The cells of such a tumor are capable of retaining their vitality for a long time, being nourished by the large amount of blood which surrounds them, until a fresh supply is brought through the adhesions, when the tumor may continue to grow as before. In the case of a cyst, it is also conceivable that its secreting cells might soon enough receive nourishment from the new source to continue to functionate as before. We know that the animal cell is capable of retaining its vitality free in the peritoneal cavity for a long time; and examples of the migration, transplantation and renewed growth of intra-abdominal tumors are numerous.

The comment of Spencer Wells,[1] that gangrene is inevitable if the rotations are so complete and enduring as to strangulate the arteries, is not in accord with our present knowledge. It is true that such an imperfectly nourished tumor-mass is a *locus minoris resistentiæ*, and very prone to become the seat of bacterial development. Such organisms may gain admission from within, from the tubes, or by tapping. The prognosis of the unoperated case, under such circumstances, becomes a very different one.

Thornton has figured the mortality in the cases upon which he has operated at 7 per cent. Of the four deaths, two were certainly due to the previous infection of the cyst by tapping, and not to any effects of rotation. He regards the dangers of operation as scarcely more than those in operation upon the uncomplicated cases.

In conclusion, judging from the foregoing cases, I may say that the two great dangers to be apprehended in cases of rotated ovarian tumors are hæmorrhage and intestinal obstruction; and in these two dangers is sufficient justification to regard the lesion as one of emergency, demanding operative relief.

[1] Wells: Ovarian and Uterine Tumors, 1882.

THE OPERATIVE TREATMENT OF NON-MICROCEPHALIC IDIOCY.

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WITHIN the past few years much attention has been paid to the surgical treatment of various cerebral diseases, which had formerly been considered incurable, and the sufferers from which either had to be relegated to some institute for the care of imbeciles or remain a burden in their homes, requiring constant watching and care. To Fuller, of Grand Rapids, Mich., belongs the credit of having first suggested the idea that in cases of imbecility accompanied by microcephalus something might be effected by relieving cerebral tension. Much has now been written on this subject, but little attention seems to have been paid to cases of imbecility in which microcephalus was absent or not marked.

As I have operated on two cases belonging to the latter category,—one fatal and the other not,—and have had the pleasure of examining and observing some other cases, it may possibly be of some interest to review these two cases, and make a few remarks on the subject of imbecility in general, without microcephalus.

CASE I.—*Imbecility consequent to an attack of Meningitis; Craniotomy; Death.*—L. H., female, age four years, Kansas City, Kan., was brought to me in the end of March, 1892. When patient was eight months old she could say a few words,—*e.g.*, "papa," "mamma," etc. About that time she suffered from meningitis, being unconscious for a period of four or five days. From this illness patient's imbecility dated. Nine weeks ago a similar attack of meningitis was passed through. Patient can now say nothing but "papa." She will

not play with other children, is mischievous, and given to knocking her head against various objects. The calls of nature are not attended to. During the past ten days she has been crying a great deal. The head appears well developed, especially posteriorly, the development along the coronal sutures being less than elsewhere. In spite of a gloomy prognosis as to the immediate danger of an operation, and the statement that the work would be purely experimental, the parents desired me to operate. My judgment as to the justifiability of an experimental operation in this case was based (1) on the results often obtained by what White terms "operations *per se*" in epilepsy; (2) on the results obtained by craniotomy in cases of microcephalus.

On April 2, 1892, assisted by Drs. Lanphear and Thrush, I operated in All Saints' Hospital. The operation consisted in removing, with trephine and Keen's forceps, a wide strip of bone from a point slightly behind the vertex to the edge of the hairy scalp in front. The left side was first attacked. The skull was found to be $\frac{1}{8}$ inch thick posteriorly and $\frac{3}{16}$ anteriorly. When first exposed the dura did *not* pulsate, but pulsation soon appeared. The dura was thick, hard, and in the posterior part of the exposed area somewhat injected. It was very firmly attached to the bone. On the right side dural pulsation was found as soon as the skull was opened. Immediately after operation shock was great, but fair reaction was obtained before long. The temperature on the evening of the operation was 101° F., but by four o'clock next morning it had run up to 106°, while the pulse was fair, though rapid. The skin was dry and the face cold. At 8 A.M. the patient died. No autopsy could be obtained. I regret exceedingly having operated on both sides of this head at one sitting, as, had the operation been confined to one side at one sitting, probably the child would have survived the injury.

CASE II.—*Imbecility probably due to Maldevelopment of Cortex Cerebri; Craniotomy; Improvement.*—A. B., male, aged twelve years, son of healthy parents, with good family history. The patient was brought to me on December 2, 1892. When four months old he fell from his nurse's knee, but whether he sustained any injury or not is unknown. Up to this time he had shown no signs of any mental want. Between the ages of nine and twenty months he suffered from "fits." During this period, and for years afterwards, he would not notice anything. Walking began when he was two or three years of age. Patient was deaf up to his sixth year, but has now very acute hearing.

Present Condition.—The patient is a thin but apparently healthy boy of cleanly habits; he is extremely restless; when standing he continuously sways from side to side, standing first on one foot and then on the other; his hands are in constant but apparently voluntary motion; his face uniformly presents a worried, puzzled expression, and he constantly frowns; the attention is never fixed on anything for more than a few seconds; he seems to know what is said to him, but won't answer questions; if he knows a certain article and where it lies, he will fetch it when asked to do so, but does not understand explanations as to what is wanted or where it is; he is generally obedient, though often stubborn; he is very musical, and can hum any tune he happens to hear; sad music affects him much.

The head is not microcephalic, but there is a slight depression near the coronal suture on both sides, more marked on the left than the right.

January 7, 1893. I operated with the assistance of Drs. Lilly and Thrush. The skull on the left side was exposed by a long antero-posterior flap, the base of which was anterior and corresponded to the edge of the hairy scalp; a trephine was applied to the posterior portion of the frontal region one inch from the middle line; the button of bone removed was of normal thickness; the dura bulged into the opening, but *no* pulsation was present; with Keen's forceps a strip of bone three and a quarter inches long and varying in width from one-half to one inch was removed; the bone was thickest (one-fourth inch) where there was a depression beside the coronal suture; hæmorrhage from the diploë was free; pulsation was now visible and palpable; the dura was opened at the point where the trephine had been applied, and about one drachm of clear fluid escaped; the surface of the brain appearing healthy, the wound in the dura was sutured and the scalp replaced; the morning following the operation the patient's relatives were astonished to hear him ask for a drink of water, a thing previously unknown in his history. From that day on he asked for various things he desired, such as "cracker," "orange," etc., and when, in spite of his struggles, it was sought to give him a dose of calomel, he very vigorously protested by saying, "Stop that."

On January 27 he named me correctly for the first time.

On April 17 I operated on the *right* side, assisted by Drs. Griffith and Lilly. The method employed was the same as already described. The parietal bone was found to be very red in color, while the frontal

was pale; when the skull was opened pulsation was very feeble, but it soon became more vigorous; the brain bulged into the opening, especially opposite the depression on the skull already referred to; on the evening after the operation the patient was extremely thirsty, but the attendants, in accordance with my instructions, abstained from giving him much fluid; when I saw him he was constantly calling for every sort of thirst-satisfier he knew, and so I ordered the nurse to give him there and then some ice; soon after I left he again became thirsty, and demanded "ice," "water," "pop-water," "orange," etc.; the nurse being obdurate, he called for me repeatedly by name. I mention this to show that the patient had become capable of expressing his wants and of *reasoning* that, as I had given him ice before, I might allow him to have it again, if I was present. When I last saw the patient, a few days ago, he recognized me by name, although he had not seen me for several months. His family, who are exceptionally intelligent people, consider him infinitely happier than formerly; he has lost his frowning, worried expression; none of his early gains have been lost, but under his sister's tuition distinct progress has been obtained; he will frequently answer simple questions correctly, and asks for many things which he desires; in various ways he gives evidence of a capability for reasoning. Although he is still an imbecile, yet he is not such a burden to his relatives as he formerly was, and there are signs that a capability for education exists which was formerly entirely absent.

In the first case which is here reported, to what cause must death be ascribed? It must have been due to one of three causes, —viz.: (1) Shock; (2) meningitis; (3) hyperpyrexia due to injury of certain thermotaxic centres. The history of the reaction and the great elevation of temperature disposes of the shock theory. One would hardly expect meningitis to develop and cause death within a period of less than twenty hours after an operation, even although the patient presented the history of having previously suffered from meningitis. To my mind the third explanation appears the most plausible. It is based on observations made by Mr. Horsley and on cases reported to me by two of my colleagues in Kansas City. In one fatal case of craniotomy, reported by Horsley,[1] after a careful autopsy had been made, he was forced

[1] Brit. Med. Journ., 1891, Vol. II, p. 580.

to the belief that hyperpyrexia caused by injury to certain cortical centres was the cause of death, and that these centres were in the motor region. His conclusion as to the existence of such centres was fortified by the observation that in various forms of paralysis due to cortical lesions the temperature of the paralyzed limbs was higher than that of their fellows on the opposite side. Dr. Lanphear informs me that in a case in which he trephined and subsequently used drainage with a rubber tube, the temperature suddenly ran up to 104½° F. On opening the wound, it was found that the drainage-tube had slipped under the skull and lay between dura and bone over the motor area. There were no signs of meningitis. Removal of the offending drain was quickly followed by a drop of the temperature to normal. A similar experience was noted by Dr. H. E. Pearse.

Imbecility seems to be due either to *maldevelopment* or to *atrophy*, the latter being the result of any one of a considerable number of affections, such as meningo-encephalitis, embolism, hæmorrhage, pressure from old cysts, etc. In atrophic cases we have *destruction* of cerebral tissue by a process of fatty degeneration, or by the formation of sclerotic or scar tissue, which destroys and supplants the normal structures in a manner similar to that in which we know cirrhosis destroys the parenchyma of the kidney in chronic interstitial nephritis. If during the active stages of this atrophic process operation could arrest its progress, then much good might be done, but, unfortunately, in many of these cases such a conclusion can hardly be hoped for. Where the atrophic changes are not far advanced and are excited and kept up by the irritation of a cyst, or such like lesion, or even perhaps by the presence of meningitis, then early operation may prevent further atrophy. It is, however, inconceivable that such treatment or any treatment could restore the already destroyed nerve-cells to functional activity. When the atrophic condition has once been fully developed, then operation presents no prospects of good resulting, unless we think that, in individual cases, sufficient potential tissue remains to be of service, if put under conditions in which development is possible. In this connection it is worth noting that the brain can develop at least up till the

twentieth year.[1] For these reasons it is probable that, even had Case I survived the operation, no great improvement would have been obtained.

So much for the atrophic causes of imbecility, but idiocy may be the result of maldevelopment of several classes, only two of which will be considered here. Of microcephalia nothing may be said. It is outside the scope of this paper.

I. *Simple Maldevelopment.*—To this class belongs Case II, and also a case I saw in consultation with Drs. Griffith and Lanphear, and in which these surgeons operated with very gratifying results.[2] Here we have a condition of the brain in which there is "an *apparent* (the italics are mine) atrophic condition of the minute structures of the hemisphere, chiefly cortical, the cells resembling those of a new-born child, but with no apparent gross defects in the brain."[3] In cases belonging to this class, we may hope to get the best results; in fact, already, with our imperfect knowledge and probably imperfect technique, the results have been most astonishing. To me it was a most wonderful sensation to hear a boy, only a few hours after he had been operated on, ask distinctly and *intelligently* for water when he had never been known to ask for even such a simple thing as that throughout the whole of his previous existence.

Craniotomy in this class of cases seems to remove a *something* which has been hindering development, and to a greater or less extent impeding or preventing the action of some parts of the brain which have already been more or less developed. The fact that in such cases when the skull is first opened there has always, so far as my observation goes, been a total lack of the normal cerebral pulsation, and that this pulsation appeared after a short time, points to a condition of exaggerated tension as the cause of the maldevelopment. Our knowledge is, however, too limited as yet to dogmatize. As already mentioned, improvement of mental function is observable within a few hours of operation. This change is, of course, too early to be explained

[1] M. Allen Starr, Brain Surg., p. 134.
[2] Proc. Mo. State Med. Asso., 1893.
[3] Starr, loc. cit.

by any new cerebral development; it must be due to the removal of some impediment which has been keeping already existing cerebral substance in a state of functional inactivity.

II. *Porencephalia* is another form of maldevelopment occasioning imbecility. Here the agenesis is so great that an opening exists between the surface of the brain and a widely-dilated lateral ventricle beneath, the ventricle and the opening into it being full of fluid. This condition is very similar to hydrocephalus, but there is no distention of the head itself.

I have only had the opportunity of studying one case of porencephalia. In this case the symptoms were entirely similar to those seen in simple maldevelopment. Dr. Griffith, with whom I saw the case, operated. During the course of the operation the dura was incised, a great quantity of cerebro-spinal fluid escaped, and the whole hemisphere seemed to collapse. The patient died the same day. At the autopsy the brain was found to be unilaterally porencephalic. The same surgeon has related to me an exactly similar case in which the result of operation was the same. Dr. Clayton Parkhill, of Denver, recently told me that he had performed craniotomy on one side of an idiot's skull, abstaining from making any dural incision. No benefit accrued from the operation. When the other side of the skull was opened fluid was seen under the dura, and on an incision being made much clear fluid escaped, and the mere shell of tissue which represented the hemisphere collapsed. Death soon ensued.

Such experiences show that it is certainly at the present day impossible to make a differential diagnosis between simple maldevelopment and porencephalia, but that when the skull has been opened, and examination of the meninges indicates the latter lesion, then the membranes should not be incised. If it is thought that the withdrawal of a small quantity of the fluid will be of benefit this can be done with a hypodermic needle, but any rapid escape of the fluid is extremely hazardous.

In selecting cases for operation the patient's personal history must be our main guide. Careful inquiries must be made as to the presence or absence in the past of symptoms which would

lead us to suspect that hæmorrhage, inflammation, or such like troubles had been the original cause of the imbecility. A point in the history which I consider of very great importance, but of which, so far as I know, no notice has been taken, is the question whether or not before the imbecility manifested itself there was any mental development, and whether the imbecility was accompanied by the loss of the mental development previously attained, or merely by this development ceasing to progress.

In non-microcephalic cases where up to a certain time mental development had progressed but subsequently has been lost, we are surely justified in believing that an atrophic process has been established, and if it has lasted any considerable time, but little may be expected from operation. On the other hand, if, when imbecility has been established, this degree of development has not been lost, but has remained *in statu quo*, or has advanced even infinitesimally, we are forced to the conclusion that the trouble is not atrophy but maldevelopment, and operation *may* here provide the conditions necessary for proper progress. If there has never been any mental development exhibited, we have no means, other than exploration, of knowing the cause of the idiocy.

In microcephalia the conditions are different, but, to quote Kipling, "that is another story."

When performing the operation of craniotomy the surgeon ought to remove a wide strip of bone. In a case of congenital microcephalia, in which it may be incidentally stated that no improvement resulted, I had occasion to operate twice on the same side of the head. Although only a few weeks divided the two operations, yet at the second setting it was found that very much of the opening formerly made had been filled up by a new formation of bone. This was so marked that it gave one the impression that a defect one-halt inch in width would soon have been obliterated.

REPORT OF CASES OF SURGERY OF THE URINARY BLADDER INVOLVING SUPRAPUBIC SECTION.[1]

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I. Carcinoma of Female Urethra.

CASE I.—*Carcinoma of the Female Urethra treated by Suprapubic Cystotomy à Deux Temps, Excision of the Urethra and Vesical Neck, and Closure below of the Resected Bladder.*—Mrs. H., aged fifty, with no family history of cancer, entered St. Mary's Hospital July 24, 1893, seeking relief from carcinoma of the urethra and adjacent parts. Eighteen months previously a hard nodule about the external meatus had attracted her attention, and during the following five months had steadily grown to a considerable size, accompanied by pain, irritation, and, latterly, foul, ichorous discharge. She then, June, 1892, consulted an esteemed colleague, who diagnosticated carcinoma and very freely removed the growth, the patient being fully relieved for ten months, when ichorous discharge and a slowly-growing tumor reappeared in the same locality. After July 1, 1893, growth and ulceration were very rapid, accompanied by sharp lacerating pains and, latterly, by great urinary disturbances. On her entry into the hospital, July 24, the anterior vulvar commissure was occupied by a fungoid growth involving the clitoris, nymphæ, urethra, and anterior vaginal wall, back to the base of the bladder. The urethra was completely involved, and catheterization was very difficult. The superior chains of superficial inguinal glands on both sides were greatly infiltrated. Clearly the disease had progressed beyond hope of eradication. The only question was as to the abatement of symptoms, possibly some retardation of the disease.

It was proposed first to change the water-course by making a

[1] Read before the Minnesota Valley Medical Society, December 5, 1893.

permanent suprapubic drainage and to remove the infected inguinal glands, then by a second operation to remove the primary mass entirely by taking away the nymphæ, clitoris, vestibule, urethra, and a portion of the anterior vaginal wall, back to and including an inch of the vesical neck and to close the bladder from below. It was thus hoped to get rid of the painful ulcerating and foul external growth, prevent urinary complications already threatening,—*e.g.*, retention, later incontinence, and cystitis. Recurrence appeared more probable at a distance with less distressing symptoms than *in situ*, where it must of necessity prove most disagreeable.

The patient and Dr. J. W. Byrnes, who kindly referred her to me, approving of the proposition, July 25, the first stage of the operation was carried out by a median incision carried down to the bladder, the wall of which was anchored to the skin by two stitches and the wound stuffed with iodoform gauze. The infiltrated glands were then quickly removed as thoroughly as possible. The vesical wall was thus anchored to the abdominal walls because the organ tended to fall so deeply away from the abdominal wall even when moderately distended, and when empty falling three or four inches below the point at which it was desired to establish the permanent opening. This fixation of the viscus appeared to interfere with the action of the detrusor as retention followed, and was relieved with difficulty by catheterization, from which moderate cystitis followed.

On the fifth day, the suprapubic wound having granulated well without trace of pus in it or the extensive inguinal wounds, the bladder wall was incised and a small area more accurately coapted to the skin at the upper end of the former incision. A large catheter, passed to the fundus and fixed to the dressing so that the distal end fell below the bladder level, served as a very complete drain. The growth was removed by an incision through the internal border of each major labium down to the pubic ramus, everything being cleared away from the bones for two inches downward, thence back to one inch behind the internal meatus urinarius. The anterior bladder wall was carefully coapted to the posterior by twenty silkworm-gut sutures, and the vagina and labia so approximated as to nearly close in the resected area. On the twelfth day the bladder sutures were removed, the parts being fully healed; no urinary leakage at any time took place. The patient was never wet by the suprapubic drainage, and left the hospital on the seventeenth day after the second operation. A short stem was worn in the suprapubic opening to

insure a patulous condition of the newly-formed fistula, and by using a catheter four or five times in the twenty-four hours she was comfortable and in perfect control of the urine, never being soiled by overflow day or night. Of the immediate results it may be said they were all that could be desired. As to the total gain to the patient, but three and a half months having elapsed little may be justly said.[1]

Recurrence is, of course, to be anticipated, but under analogous circumstances relapse has been known to be unexpectedly delayed, and then with no local return. Local recurrence will, we may justly hope, be longer delayed, as the incisions went wide of any suspicious tissue and the growth was of a form that extends locally by pretty well-marked lines. It is the great involvement of distant lymphatics which presage return, first, because it is not probable that absolutely all were found and removed; second, even so, who may predict the extent of dissemination to internal organs? The glands involved here are those involved by carcinoma of the penis. A momentary digression may be pardoned to contrast two cases of that form of the disease as showing the unpredictable variations in the behavior of carcinoma. In one, a most advanced carcinoma of the glans penis, removed six years ago with faint hope, has never to this day returned, while the most superficial epithelioma of the glans which I have seen, recognized in the very earliest stages, when none but an excellent diagnostician would suspect, and the most experienced were inclined to hesitate before pronouncing so slight an infiltration of the upper layers of the skin, malignant. Despite early recognition, prompt and free removal, without local return, it had already sown far and wide the malignant seed by the unrecognizable lymphatics, and the patient succumbed in less than a year. Again, two years after the removal of a cancerous male breast and suspicious axillary glands, without trace of return in either location, lung symptoms have led to examination only to reveal greatly-involved mediastinal glands. Complete and free local removal, especially in certain forms of carcinoma, is more sure of local than of general cure.

[1] January 1, 1894.—A report just received from the patient indicates her present condition to be satisfactory and comfortable.

So far as known, the procedure adopted in the above case is without precedent in the treatment of carcinoma of the female urethra and vesical neck. Periurethral carcinoma in the female is apparently a rare affection, but if those cases be included in which malignant disease of the vulva involves the urethra, cases are considerably more frequent. In such, should it be desirable to remove so much of the urethra as to render the bladder incontinent, a course similar to that here practised might prove useful. Indeed, might it not be desirable, in some unusually troublesome cases of incontinence in females from injury or overstretching of the sphincter, to close the bladder below and give a suprapubic exit to the urine? I have now in mind one case which was repeatedly turned away as without hope of relief, to which I would now venture to suggest such a measure. It must be remembered, however, that permanent suprapubic exits for urine vary greatly in the ease and comfort of their management. In capacious bladders, with fairly normal walls, a high opening may be of very easy management. With inflamed, hypertrophied walls a suprapubic opening may be very unmanageable, with an overflow even more unbearable than the constant leakage from the normal opening. I should think the suprapubic fistula, with reasonable care, need not more predispose to cystitis than a patulous urethra ending in a culture-field of moist filth.

This case may serve to call up other interesting queries. First, as to the advantages of operating in two stages. Just how wide a range of usefulness this procedure in suprapubic invasions of the bladder will ultimately achieve, perhaps only time will tell. In certain cases, however, there can be no possible doubt of its great utility in lessening some of the dangers and difficulties of the operation. When the work to be done is the simple establishment of a permanent drainage, there is surely much to gain and nothing to lose by this method which renders the cystotomy extremely simple and safe. Even retention need not debar it, as the bladder may be aspirated for a few days, if necessary. Indeed, it is probably to be regretted that this was not resorted to in the above case in preference to difficult catheterization through an ichorous mass with resulting cystitis. In

this case, though a very simple one by any method, the bladder falling away from the anterior abdominal wall showed that a large and dangerous *cavum Retzii* stood ready to receive infiltration and infection. Proceeding by two stages these dangers are practically avoided. Second, in case of difficulty in avoiding the peritoneal fold, its incision need not materially increase the dangers of suprapubic cystotomy performed in two stages. Enthusiasts may declare that the peritoneum is easily avoided, but, as will be pointed out in Case III, there may occasionally be relations such that its incision is unavoidable, while less rarely for the varied indications for which we now wish to enter the bladder by this route, either considerable time is sacrificed, the fold is possibly opened and sewed up again, often, it is true, without injury, or the prevesical tissues are much disturbed and torn up, all three of which alternatives it is obviously desirable to avoid. These very decided advantages must be awarded to this method.

In operations for enlarged prostate and vesical tumors it would seem less available, because of the often necessarily extensive incisions to gain working access, and the rough handling which the granulating surfaces must often receive. However, as such operations are frequently in part exploratory, ending in temporary or permanent drainage, rather than in completion of extensive and dangerous operation, it would appear that such a simple precaution which could do no harm further than an additional anæsthesia in case of radical procedure at the second operation might be, as a rule, adopted.

II. Bony Sequestrum in Cavity of Bladder.

Case II.—*Persistent Vesical Hæmaturia and Cystitis; Exploratory Suprapubic Incision; Sequestrum of Bone found in Bladder.*—F. K., painter's apprentice, German, aged twenty-two; his family history was excellent; father, mother, and six brothers, all very healthy; there was no tuberculosis even in remote relatives so far as he knew; the patient, a robust, muscular young man of excellent habits, had never been sick until the present trouble began. About six months before coming under observation (early in May) he began to be annoyed by moderate frequency in micturition by night and by day.

On two occasions, during the first month of his disease, he had attacks of severe pain in the left side as well as in the bladder, and had to quit work for the day, but gave no further history of pain in the loins, either before or since. After four weeks of this slight urinary disturbance he began to pass bloody urine. The hæmaturia, though very persistent, was never great. The first part of the urine was often clear, but at the end more or less blood always appeared, and the last portion of urine uniformly contained more blood than the first. The frequency in a few weeks reached about every hour and a half, and was slightly greater by day than by night. When he first presented himself, early in May, the urine was acid, always contained blood in sufficient quantity to give a claret or coffee color to the urine, with considerable mucus and pus, and was usually of offensive odor. The frequency of micturition ranged from one to two hours day and night, urination precipitant, with the acme of pain after urination. The attacks of pain in the loin gave some evidence of the possibility of stone. Careful sounding revealed none, but showed a bladder very irritable and tender, somewhat thickened, especially at the fundus, and the instrument greatly increased the bleeding. The age, previous health, history, absence of urethral infection, and results of palpation with the sound, seemed to lead to diagnosis of villous tumor, almost positively, by exclusion. He was anæsthetized for better examination with confirmation of above results, but a faint hope of being able to make a cystoscopic examination while under chloroform proved futile for the following reasons:

(1) Instrumentation so increased the hæmorrhage that the most rapid washing and examination could not preserve a transparent medium.

(2) Anæsthesia pushed to farthest limits of safety failed to sufficiently quiet the detrusor for the retention of three ounces of water, or prevent a tremor of the body, which alone would have rendered reliable cystoscopic examination exceedingly difficult.

After three weeks of medical treatment to abate the cystitis, with little, if any, good result, and no further light as to the diagnosis, he entered St. Mary's Hospital for operation May 31. He was found then to be suffering from typhoid fever, and surgical interference was, therefore, postponed.

During the fever the hæmaturia was much increased. By August 7 he had regained his former health, except being twenty-two pounds under his former weight of 149 pounds, and entered St.

Anthony's hospital for operation. After four days of preparatory treatment, August 11, suprapubic cystotomy was performed with considerable difficulty, owing to the inability to distend the bladder. All through the operation it was found impossible to so chloroform the patient as to paralyze the detrusor, or prevent a certain tremor of the body when the detrusor was distended. More than three or four ounces were so strongly repelled that it was not thought safe to use further force. The bladder, though not rising above the pubes, was reached after considerable trouble and careful pulling up of the peritoneum. On opening it, judge of my astonishment in finding the only thing never thought of,—viz., a sequestrum of bone about three-fourths of an inch long, one-half inch wide, and one-eighth inch thick, much macerated by long immersion in urine, and so soft and slimy with mucus and blood that it failed to give any recognizable sensation to the searcher. Exploration with the finger detected the site of its origin on the posterior surface of the right pubic bone. The vesical mucosa was everywhere injected and inflamed, but the *bas fond* was most severely affected, being superficially eroded. Evidently the spicular sequestrum had been hourly squeezed down against the vesical neck for months. Doubtless it was becoming softened and dissolved, possibly in time it might have become disintegrated, and spontaneous cure have resulted. The bladder needing drainage the walls were stitched to the skin, a double soft-rubber tube of good calibre carried near to the fundus vesicæ, tightly packed about by iodoform gauze, and the viscus drained and washed. The drainage was kept up until October 3, perhaps longer than necessary, though it was not until then that the urine was free from traces of blood and muco-pus in slight quantity. The bladder having been so contracted and deep in the pelvis, and its walls drawn up to the skin, the latter had become very firmly adherent to the thick muscular abdominal wall. On October 3 these were pretty thoroughly, but not quite completely, dissected away. The vesical walls were carefully approximated with silkworm-gut sutures, and the wound above left unstitched, but stuffed with gauze, to guard against infiltration in case of possible leakage, as well as to allow removal of the non-absorbable sutures. There was no leakage, and the wound granulated so rapidly that the stitches were lost before I was aware of it. Though considerably concerned as to the fate of these stitches, they remain to-day, a little over two years, without disturbance. At the end of ten days the patient left the hospital, and has remained well. For the first

three or four months the bladder was evidently teased and disturbed by the abnormal attachment to the abdominal wall resulting first from not fully relieving all its adhesions; second, from the new one formed by healing the abdominal wound by granulation. Lately this discomfort, felt when the detrusor completely contracted, appears to have fully subsided. However, I believe it would be better to avoid such abnormal fixations.

In this case it is evident that the diagnosis could not have been made, probably not even suspected, without a direct or indirect intravesical inspection. The method of cystoscopy, now doing so much for bladder diagnosis, must usually fail in such instances. Perhaps at an early date in the disease it might have proven practicable. But the scoffers at cystoscopy may ask *qui bono?* Simply this, could it have succeeded, the perineal *boutonniere* would have been fully competent for relief of the trouble. It could have been well performed in a few seconds instead of in this case by a tedious and prolonged operation. It is certainly far less dangerous. It would have required no second operation and would have left no adhesion of the bladder to the abdominal wall. The patient lived, but took more risks. He had more discomfort and his attendants had more work than the simpler operation would have entailed. This was a necessary contribution to unavoidable uncertainty in diagnosis. Tumor being with most probability anticipated, it was only right to explore by a method fully competent to its management after its discovery. It, in a small way, emphasizes the great value of cystoscopy in the considerable range of cases to which it is now applicable. Lastly, there appears absolutely nothing in the health or history of the patient to account for this limited necrosis on the posterior aspect of the pubic ramus.

III. Tumor of Ischium Compressing Prostatic Urethra.

Case III.—*A Huge Ossifying Enchondroma of the Pelvis; Long symptomatically Simulating Prostatic Hypertrophy; Final Complete Urethral Obstruction relieved by Permanent Suprapubic Drainage; Unavoidable Opening of the Peritoneum.*

In 1885 I casually examined D., a Bohemian laborer, aged 69, being sent by my brother to relieve a retention which had recently, for the first time, occurred, though some vesical irritation and loss of detrusor power had previously been observed. Catheterization was easy. A rectal palpation was made, of which it is only remembered that the impression remained of the largest, hardest, and most globular prostatic hypertrophy which I had ever encountered. The mind was prepared for this erroneous diagnosis, the visit but a hasty one and not repeated, but the tumor must at that time have occupied the prostatic location very accurately, for the wholly unusual feel which was sufficiently recognized as incongruous, made a lasting impression, which still appears as fresh as if it were but yesterday. I reported the enlargement to be prostatic, but of such peculiar form and hardness as to lead me to suspect some new growth rather than the usual so-called hypertrophy. Catheter life was continuous from that day, and after some six years of more or less trouble in self-treatment until 1890 with soft catheters, later stiff instruments being required to pass the perineum, he came under my observation when self-catheterization was no longer possible. For a time Dr. J. B. Dunn was enabled to get a catheter into the bladder, but later the route was completely blocked by a large irregular and very hard tumor, which now nearly filled the pelvis and bulged out towards the perineum, while an irregular mass projected above the pelvic brim into the abdomen and a large offshoot escaping from the obturator foramen presented as a fist-sized mass on the inner aspect of the left thigh. Locomotion was impossible from interference of the projections of the growth, and rough and unclean catheterization had led to cystitis and periurethral suppurations.

In establishing suprapubic drainage it was not possible on account of outgrowths of the tumor in the prevesical space to avoid the peritoneum, and in cutting down on the bladder that membrane was twice incised. Before opening the bladder, the parietal peritoneum was carefully stitched to that of the bladder about an inch from the proposed opening, the urine sufficiently withdrawn by aspiration to relieve the tension of the bladder, so that its walls could be drawn out like the short snout of a tea-pot, and finally sutured to the skin in the upper part of the incision. The remainder of the abdominal wound being closed by deep sutures. A large catheter, as in Case I, served to keep the bladder drained, especially by pumping out every two or three hours by attaching a glass syringe to the catheter, just

as abdominal drainage-tubes are evacuated. The wound was thus not contaminated and readily healed. A fistula just the size of a large catheter high up towards the umbilicus served the patient well so far as the urinary function was concerned for ten months, when the long bedridden and poorly cared-for patient succumbed to an attack of pneumonia at the age of seventy-six.

The examination of seven years before had left so strong an impression of the prostatic origin of the growth that I was very loth to surrender my first impression. After careful dissection it was difficult to decide its precise origin, but the prostate lay intimately embedded in a part of the growth. Sections through tumor and prostate finally showed the latter organ normal in size and structure, and, though the tumor was attached to various parts of the pelvis, its origin seemed to be from the inner surface of the left ischium.

This case is reported on account of the character of the growth,—structurally benign, yet, from its location, relatively malignant,—and especially on account of its early semblance to prostatic enlargement. It is, further, an illustration of the occasional instance in which it is practically impossible to avoid the peritoneum in high cystotomy. I had not considered operation by two stages at that time. To those inexperienced in cystotomy under varying circumstances, cases like this might appear to argue against the necessity of making two stages in such an operation. While I would now delay the bladder incision in such a case, aspirating a few times through the exposed wall as a further precaution against contamination of the wound, it must be remembered that the conditions were here more highly favorable to immediate opening than is the rule in cystotomy. The bladder was large and atonic, so that several ounces of urine could collect before danger of any gross overflow could occur. Any microscopic contamination was cared for by iodoform and two rows of fine suturing. Under such circumstances, not only is suprapubic cystotomy commonly fairly easy of performance, but the after care is quite simple, and the comparative control of the urine, by various means, easy, comfortable, and complete.

Indeed, it would appear that the great variety of opinion expressed upon the desirability, the ease, the simplicity of after-

management, and the comfort in results of suprapubic bladder operations, arise from conclusions drawn from too brief experience with quite different vesical conditions. One tells of the ease and simplicity, another of the comparative difficulties encountered in such procedures. One speaks of siphon-draining as being as easy as lying, another discards such arrangements as delusions and snares. Another, with the surgical optimism of the day, speaks of suprapubic invasion of the bladder as a mere bagatelle, while there is little or nothing decisive to indicate that the mere opening of the bladder above the pubis is less dangerous than the old lateral perineal lithotomy incision, if, indeed, the evidence be not still in favor of the latter. That question, however, is dead. Lithotomy is not a lost, but practically an obsolete art. Suprapubic cystotomy has arisen for new indications which advancing surgery is hastening to meet. It remains for us to more fully master its technique, especially the modifications necessary under the greatly-varying circumstances to which the procedure is applied. It is plain that more accurate and detailed diagnosis before operation is necessary to the uniform choice of the safest methods in bladder surgery, as well as to greater uniformity of opinions upon vesical operations, and the building of statistics of worth as guides to judgment. The cystoscope is destined to add to the considerable achievements already wrought by its use; but a more accurate and wide-spread knowledge among the profession of vesical disorders, and the simple means of complete diagnosis, still quite generally neglected, must do even more, since they are of more ready and universal application than indirect illumination.

REPORT OF A CASE OF CARCINOMA OF ILEUM; INTESTINAL OBSTRUCTION RELIEVED BY ANASTOMOSIS WITH A MURPHY BUTTON.

By B. MERRILL RICKETTS, M.D.,

OF CINCINNATI.

THE patient, an apparently robust woman, aged fifty-six years, on November 21, 1893, consulted Dr. Dickinson for constipation and nausea. There was distention with considerable tenderness and pain in the right iliac fossa. She gave a history of having been bloated for several months; in fact, said that she had been more or less so since the beginning of her menopause several years previous. She began on the following day to vomit fæcal matter, and could not retain anything in the stomach. The various remedies were given for constipation and nausea with no good result. An operation was advised on the basis that there was obstruction of the bowel of some kind. She absolutely refused any operative procedure, and continued to become more enfeebled, with now and then a slight watery discharge from the rectum. The temperature remained normal and her mind clear.

She became somewhat emaciated, but was persistent in her refusal for an operation until December 8. A consultation was held with Drs. Dickinson, Edwin Ricketts and Gillett present, and she was told that she would surely die without an operation, and that the chances were greatly against her with the operation. Consequently, on the following day, December 9, at 11 A.M., under the influence of chloroform, I made an incision about three inches in length in the median line, about half-way between the umbilicus and symphysis pubis. The abdomen was very much distended. The ileum, which was greatly distended, perhaps three inches in diameter, purple, and filled with watery, fæcal matter, was drawn through the incision. I found the obstruction without any difficulty whatever (Fig. 1),—a growth about the size of a small hickory-nut in the body of the ileum

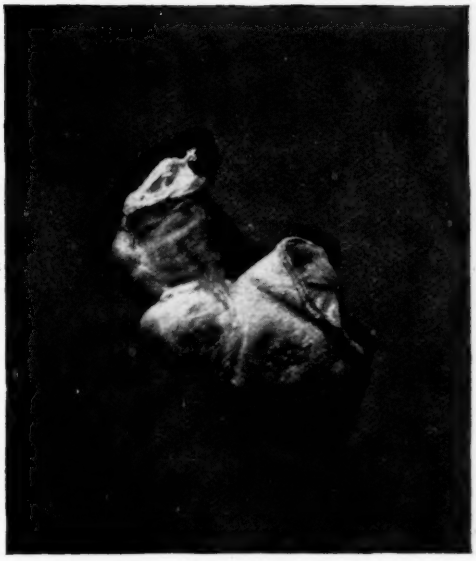

FIG. 1.—Carcinomatous nodule in wall of ileum.

about five inches from its connection to the large intestine. I immediately excised the diseased portion, making my incisions about one inch to either side, the excised piece measuring four inches. I found that the lumen was six or eight times greater above than below the growth, showing the results of prolonged distention. I then attempted to make a Maunsell operation, end to end anastomosis, but found that the distal end of the gut was held down by the omentum, so that the operation would be greatly interfered with, and that more time would be consumed than was for the good of the patient. In consequence thereof I immediately proceeded to make the operation with the Murphy button, which I did within eight or ten minutes.

I then found that the ileum was so loaded with fæcal matter that it was necessary to puncture about midway, allowing almost one gallon of fæcal fluid to escape. I then sewed the incision up according to Lembert, returned the viscera to the abdominal cavity, and united the abdominal wall with silkworm gut. There being no peritonitis, and consequently no fluid in the abdominal cavity, I decided not to use a drainage-tube. During the time of the operation the intestines were wrapped with towels saturated in warm water that had recently been boiled. She was placed on the bed with a rather favorable pulse, and all necessary means resorted to for restoration from shock. She had several copious operations of the same character as had been removed at the time of the anastomosis, and expressed herself grateful for what had been done, and that she was comparatively comfortable.

However, she died ten hours later from the shock. This is a most deplorable state of affairs, showing the result of procrastination. Had the operation been made two weeks or even one week before, there does not seem to be any reasonable doubt of her recovery. The operation was not prolonged, the entire amount of time consumed being not more than twenty minutes from the time the abdomen was opened. Fig. 1 shows the diseased portion excised.

At the autopsy, fourteen hours from the time of death, or twenty-four hours from the time of operation, the coaptation of the gut was found to be perfect. I am satisfied that the Murphy button was the most appropriate in this case, although I am thoroughly convinced that the Maunsell operation is the one to be used in the majority of cases.

It was found at the time of autopsy that the entire omentum was dotted here and there with ecchymoses, varying in size from a pea to

a silver twenty-five-cent piece. Quite a number of these spots were also found here and there over the intestines. It was found at the time of the operation that the hæmorrhage from the mesenteric vessels was very dark, more resembling black ink than blood. The intestine above the constriction was very brittle, consequently easily torn. There was no fluid within the abdominal cavity, and plastic matter had already been thrown out, partially uniting the two ends of the gut. With this state of affairs it would seem useless to attempt any kind of an operation. It was found that the obstruction was not more than five inches from the ileo-cæcal valve, hence the great difficulty in making the Maunsell operation through a small incision in an abdominal wall extensively thickened by adipose tissue.

OBSERVATIONS UPON APPENDICITIS.

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[CONTINUED FROM PAGE 362.]

Bacteriological Considerations.

THE question of the relation existing between the bacteria of the intestinal canal and the etiology of appendicitis has recently awakened an unusual interest among both bacteriologists and surgeons, owing to a more careful study of these micro-organisms. From the time when the digestive tube becomes the receptacle of food and its products, these bacteria are found in greater or lesser variety.

Attention has been particularly called to the ordinary and common form of bacillus which is found in the discharges from the intestinal canal so constantly that the latter has come to be looked upon as its natural habitat. This organism, known as the *bacillus coli communis* (Escherich), it would appear, bears a more or less definite relation not only to inflammatory conditions within the abdominal and pelvic cavities, but likewise to these conditions when occurring under certain circumstances remote from the intestinal tract. For instance, it may, according to a number of observers, pass the barrier of the intestinal mucosa, although under favorable conditions it is claimed that it may even give rise to active desquamative lesions here, and penetrate into the general circulation; thus reaching parts remote from its original and apparently normal location, in which it seems to play an innocent rôle; it has been claimed to give rise to suppurative conditions of the most decided character.

While the fact of its discovery in pure culture, in cases of enlarged spleen (Wyss), in a hæmatoma following thyroidectomy (Tavel), in diseases of the biliary passages Gilbert, Girode, Naunnyn), in abscess of the liver (Rodet, Veillon, Jayle, Stern, and A. Fränkel), in lymphangitis of the arm (Levy), in septic emphysema (Chiari), in general pyæmic infection, with suppurative meningitis (Stern), and in broncho-pneumonia, endocarditis, meningitis, nephritis, and cystitis (Henkemans), is of interest, yet its presence in connection with these conditions does not possess an importance beyond the fact that it serves to establish its migratory character in connection with our present study. Its presence in connection with suppurative peritonitis (Lamele, Reux, Rodet, and A. Fränkel) and in peritonitis consecutive to an intestinal lesion without perforation (Welch), and in cases of appendicitis, both acute, perforative, and chronic relapsing (Ekehorn, Roswell, Park, Hodenpyl), together with my own heretofore published observations upon this subject,[1] seem, at first glance, to establish a direct and specific etiological relation between the *bacillus coli communis* and inflammatory diseases of the appendix vermiformis.

In addition to demonstrating the existence of this microorganism in the exudate of the accompanying peritonitis of appendicitis, it has been shown (Hodenpyl) that the cavity of the appendix in new-born children, as well as the healthy peritoneal cavity in general, is sterile. Again, in so far as experimental bacteriology can establish the fact, the *bacillus coli communis* has been demonstrated to be pathogenic to rabbits and guinea-pigs, when bouillon cultures made from isolated colonies, obtained from appendicitis cases, are injected into the abdominal cavities of these animals (Ekehorn, Hodenpyl, Wilson). The suggestion of Ekehorn,[2] however, that, in comparatively mild forms of the disease (recurrent and relapsing cases), the virulency of the bacillus is not so great as shown by its effects upon the lower animals following inoculation with cultures derived from acute and rapidly-progressive instances of the disease, is not borne out

[1] The New York Medical Journal, Vol. LVIII, October 14, 1893, page 434.

[2] Bacterium Coli Commune, en orsak till Appendicit, Upsula Läkere. Förh., 1892–3, XVIII, 113–150.

by experiments made for me by Dr. Wilson, at the Hoagland Laboratory, an account of which will be given on page 479.

The fact that the *bacillus coli communis* can be obtained in pure culture from the peritoneal surface of an inflamed appendix which has not undergone perforation, as well as from the walls of the organ, the interior of its mucous canal, from the contents of an appendicular abscess, and both isolated and non-encysted intra-peritoneal collections of fluid which have undergone changes the result of septic influences, is now well established. It has, likewise, been conclusively shown (Hodenpyl) that this micro-organism exists under normal conditions in the cavity of the vermiform appendix.

In one of my cases of appendicitis a pure culture of the *bacillus coli communis* was obtained from a layer of plastic lymph which glued the inflamed appendix to the cæcum. The mucous membrane of the organ was not involved in the inflammation, and, although the walls of the organ were involved in an exudative inflammatory process, a large number of sections made by Professor Van Cott failed to reveal the presence of the micro-organism. It will probably be found that decided disturbances of the relations of the intestinal canal, such, for instance, as the fixing of the colon in an abdominal wound for the purpose of an artificial anus, will lead to the migration of the intestinal micro-organisms. Dr. Bristow reports to me that in a case of this kind, occurring in his service at the Kings County Hospital, a pure culture of the *bacillus coli communis* was obtained from the exudate which formed between the serous surface of the colon and the parietal peritoneum. No sutures were employed in the case, the colon being simply lifted into the abdominal wound and there supported upon a glass rod. The cultures were taken on the third day following the first stage of the operation, and prior to the opening of the gut.

The assumption, however, that the *bacillus coli communis* is the sole infecting agent of appendicitis and perforative peritonitis is apparently unwarranted, according to Barbacci, of Florence.[1]

[1] Ueber Aetiologie und pathogenese der Peritonitis durch Perforation. Centralblatt f. Allgemeine Pathologie u. Pathologische Anatomie, October, 1893.

This observer examined 14 cases of perforative peritonitis in man, and made a number of experiments upon animals. Of the 14 cases, 1 was an aspirated so-called perityphlitic abscess; 7 were typhoid perforations; 2 were perforating ulcers of the stomach; 1 of perforation of the vermiform appendix; 1 of perforation from strangulated hernia; 1 of perforating ulcer of the cæcum; and 1 of gangrene and perforation following volvulus. Bacteriological examinations were made under favorable conditions,—*i.e.*, immediate autopsies in cold weather, to exclude putrefactive organisms.

Barbacci reaches the following conclusions:

(1) In perforative peritonitis in man, cultures from the exudate yield only one organism in the vast majority of cases,—the *bacillus coli communis*. In but a single case of the fourteen was another microorganism, the *micrococcus lanceolatus* (Fränkel), associated with the *bacillus coli communis*. (2) Inoculations into the peritoneal cavity of susceptible animals (white mice and guinea-pigs) with fresh exudate of peritonitis produce peritonitis, and in eight cases out of the thirteen the *micrococcus lanceolatus* was found. (3) The *micrococcus lanceolatus* is present in about 60 per cent. of all cases, but is overlooked because it is overgrown by the *bacillus coli communis*. (4) Experiments on dogs by opening the abdomen, securing a loop of intestine, and causing a perforation by the application of caustic potash produced a peritonitis exactly simulating, both microscopically and bacteriologically, a perforative peritonitis in man. The animals died in from twenty to thirty hours, and examination after death show a general fibrinous peritonitis. Enteritis was not found in any of the cases. Pure cultures of the *bacillus coli communis* were obtained from the exudate. (5) Marked differences exist as to the result when, upon the one hand, the examination is made directly from the exudate, or by the culture method, on the other. Cultures show only *bacillus coli communis*, but by direct examination a number of different organisms may be found, the latter dying in the exudate in the early stages of the inflammation, the *bacillus coli communis* growing alone in the cultures. In dogs killed at intervals of 5, 5½, 6, 8 and 10 hours after perforation, examination showed the *bacillus coli communis* mixed with other organisms up to eight hours; after this the former alone was found. The *micrococcus lanceolatus* was not found in the experimental peritonitis in dogs.

Dr. Ezra H. Wilson, pathologist to St. Mary's Hospital, director of the Hoagland Laboratory and chief of the Bacteriological Bureau of the Brooklyn Board of Health, at my request made bacteriological examinations in the following cases of appendicitis occurring in my hospital services. The operations for the removal of the appendix were conducted aseptically,—*i.e.*, only heat-sterilized instruments, etc., were employed; no antiseptic agents were employed in the case until after the removal of the organ. In each case the latter was ligated at two points, and the section for its removal made between two heat-sterilized ligatures. The appendix was then placed in a sterilized glass tube, which was immediately sealed and forwarded to the laboratory for examination. In two cases (Nos. 7 and 8) smear preparations for direct examinations, and direct cultures were also made.

The technique of the examinations was as follows: The cultures were made in peptone bouillon from the mucous membrane through sterilized incisions in the wall of the appendix. Cultures were also made from the outside of the appendix, and also from the exudate of the peritoneal cavity in some cases, at the time of the operation. Smear preparations were made directly from the exudate; these were stained and examined immediately.

Bouillon cultures were incubated for twenty-four hours and then plated. From the isolated colonies of the plated preparations other bouillon cultures were made, which were used for experiments upon animals.

The media employed were beef-peptone bouillon and gelatin.

Case I.—November 7, 1893. Male, twenty-seven. No previous attacks. Was attacked suddenly with acute abdominal pain. Tumor developed rapidly, and was distinctly felt at the end of twenty-nine hours. Operation thirty-two hours after commencement of symptoms. Appendix surrounded by a mass of adhesions, and the seat of a cystic dilatation. No other adhesions. Appendix amputated between two ligatures and placed in a sterilized glass tube for examination. Recovery.

Bacteriological Examination.—Appendix surrounded by considerable new tissue and fibrin. Two cavities were present, separated by a constriction.

The lower cavity contained pus. Cultures were made from both cavities and from the outside of the appendix, and carried along parallel. The cultures from both developed pure *bacillus coli communis*. From 1 to 2 c.c. of bouillon cultures derived from isolated colonies were injected into the peritoneal cavities of guinea-pigs. The animals died in from twenty-four to forty-eight hours, and the organism was recovered in pure culture from the peritoneal cavity. It was not found in or recovered from the blood or organs. The peritoneal infection was very slight; the animals apparently died from general sepsis.

CASE II.—November 25, 1893. Male, fourteen. No previous attack. Suddenly attacked with usual symptoms; local tenderness developed within two hours. Fever pronounced from the commencement. No tumor. Operation on second day of disease. Appendix divided between two ligatures and removed. No perforation. Placed in sterilized tube as in Case I.

Bacteriological Examination. —Same technique as in No. I. Result; Pure cultures of *bacillus coli communis* obtained in all of the cultures. Pathogenic to guinea-pigs.

CASE III.—November 26, 1893. Male, twenty-eight. Two previous attacks; the first two years, and the second one year, ago. Present attack sudden in onset, with general abdominal pain. Temperature ranged from 101° to 102° F. No tumor. Great prostration and anxious facial expression from the second day. Admitted to hospital on the fifth day, and operated upon at once. Sero-purulent fluid in the peritoneal cavity. Appendix removed and cared for as in other cases. Appendix gangrenous, perforated in two places. Three small fæcal masses present. Patient died of profound septic intoxication and pre-existing peritonitis in thirty-six hours.

Bacteriological Examination.—Technique same as in Nos. I and II. In the Petri dish colonies of a different nature were found. These proved to be the *bacillus pyogenes fœtidis*. The colonies of *bacillus coli communis* were scanty, while those of the *bacillus pyogenes fœtidis* were very abundant.

The *bacillus coli communis* was pathogenic for guinea-pigs, causing death in forty-eight hours. The death resulted from peritonitis and toxæmia combined.

The *bacillus pyogenes fœtidis* proved to be exceedingly virulent. It was pathogenic for guinea-pigs when used in the same manner as the *bacillus coli communis*, causing death of the animal in twelve hours.

Bouillon cultures derived from isolated colonies of the *bacillus pyogenes fœtidis* were filtered through sterilized Chamberland filters, and proved to be sterile of culture. Two c.c. of this sterilized culture were injected into the abdominal cavity of guinea-pigs with a negative result. The animals recovered in each instance.

CASE IV.—November 28, 1893. Male, twenty-two. Chronic relapsing appendicitis operated upon one week following a relapse. First attack five months previously; has suffered one attack each month on an average since. No tumor. Appendix thickened, surrounded by slight adhesions, and hanging from its implantation in the cæcum in the shape of an inverted interrogation point.

Bacteriological Examination.—Cultures made from the outside of the appendix and from the exudate. Both developed pure *bacillus coli communis*. Bouillon cultures twenty-four hours old made from isolated colonies were injected into the peritoneal cavity of guinea-pigs. These caused death in thirty hours. The organism was recovered pure from the peritoneal exudate, but not from the blood or organs.

CASE V.—December 7, 1893. Male, ten. Chronic relapsing appendicitis operated upon one month following the fourth relapse. Patient also the subject of acromegalia. No tumor. Typical amputation of the appendix, which was four and a half inches long, corkscrew-shaped, placed in the directly downward (*S*) position, and notably thickened.

Bacteriological Examination.—Cultures from the appendix and its cavity developed from *bacillus coli communis*. Pathogenesis not tested.

CASE VI.—December 11, 1893. Male, twenty-four. One previous attack eight years ago, which led to the formation of abscess. This was incised. No attempt was made to remove the appendix at that time. Present attack sudden in its onset, and accompanied by the usual symptoms of an average severe attack. Chill occurred on the third day. Pneumonia developed and present at the time of the operation. Tumor present. Lumbar tenderness. Operation between the fourth and fifth day. Appendix found to be entirely extraperitoneal. Removed. The patient made a good recovery in spite of the presence of pneumonia at the time of the operation.

Bacteriological Examination.—A mixed growth developed, consisting of a micrococcus and a bacillus. The latter was rather larger than the *bacillus coli communis*, and stained very slowly. The micro-

coccus was somewhat larger than the *staphylococcus pyogenes aureus*, and stained readily. Placed in Petri dishes and isolated, the micrococcus proved to be the *micrococcus flavus aquefaciens*, and was evidently a contamination. The bacillus proved to be *bacillus coli communis*.

CASE VII.—December 15, 1893. Male, twenty-three. Four previous attacks at intervals of about a year. Present attack came on gradually for first twenty-four hours. It then suddenly developed into an acute condition, following which septic symptoms and great prostration rapidly supervened. Abdominal cavity, upon being opened, revealed some clear fluid. Some of this was obtained in sterilized Sternberg bulbs. A large sero-purulent collection surrounded the appendix. Smear preparations were made on clean slides directly from the exudate. Cultures upon agar plates were also made directly from the exudate. Appendix removed and placed in a sterilized glass tube. Patient died in thirty-six hours from profound sepsis.

Bacteriological Examination.—The smear preparations show a variety of organisms. Small diplococci resembling the *diplococcus lanceolatus*, small and large bacilli, some of which resembled *bacillus coli communis*, and a streptococcus resembling the *streptococcus pyogenes* were present. Single colonies from one agar plate, at room temperature for twenty-four hours, show pure *bacillus coli communis*. The other agar plate, placed for the same length of time at incubating temperature, showed likewise only *bacillus coli communis*. The serum drawn from the peritoneal cavity in the Sternberg bulbs before opening the encysted sero-purulent collection was found to be sterile.

CASE VIII.—December 20, 1893. Male, twenty-one. No previous attacks. Present attack developed suddenly, with usual symptoms of an average severe case. Fever present from the commencement. Appendix found surrounded by adhesions and considerable sero-purulent fluid. Cavity of peritoneum well walled off. Smear preparations made directly from the exudate, and obtained some of the exudate directly with sterilized Sternberg bulbs. Appendix removed, ulcerated and perforated. Placed in sterilized glass tube. Recovery.

Bacteriological Examination.—Cultures made from the exudate on slanting agar, and from the exterior and interior of the organ all developed pure *bacillus coli communis*. The smear preparations show the same variety of organisms as the preceding case,—*i.e.*, a diplococcus, the *diplococcus lanceolatus*, a bacillus, the *bacillus coli communis*, and a streptococcus, probably the *streptococcus pyogenes*.

CASE IX.—December 25, 1893. Male, seventeen. Chronic relapsing appendicitis operated upon in an acute relapse. Present attack came on ten days previous to admission to the hospital. Fever present since that time. Tumor present. Appendix found embedded in a mass of inflammatory adhesions. Smear preparations made. Appendix removed.

Bacteriological Examination.—Cultures made as before. Result, pure *bacillus coli communis*.

CASE X.—December 25, 1893. Female, twenty-one. No previous attack. Present attack sudden and accompanied by usual symptoms. Fever from commencement of the attack. Appendix infiltrated. No adhesions. No perforation. Recovery.

Bacteriological Examination.—Pure cultures of *bacillus coli communis* obtained from walls and interior of appendix.

CONCLUSIONS.

(1) The *bacillus coli communis* exists constantly in the lumen of the appendix and also in the exudate in the peritonitis accompanying inflammations of that organ. This can be demonstrated both by direct examination and by cultures.

(2) Other bacteria than the *bacillus coli communis* exist constantly in the exudate, and can be demonstrated by direct examination, but very rarely by culture.

(3) That perforative peritonitis from appendicitis is not a mono- but a poly-infection, and that, while the *bacillus coli communis* probably has the largest share in the infection, the presence of other organisms cannot be ignored.

THE PATHOLOGICAL ANATOMY OF THE APPENDIX VERMIFORMIS.

Two great classes of facts must always form the basis of knowledge concerning the diseases of an organ or part,—*i. e.*, first the anatomy, gross and microscopic, and the physiology of the part; second, the general pathological laws governing tissue lesions.

As has been already shown, the vermiform appendix is in effect a diverticulum from the caput coli, and retains, to a great extent at least, the structure of this portion of the larger intestine. Its exact location has been fully described in the section upon

the anatomy of the organ. In this connection, however, it will be convenient to review some of the prominent points in connection with its morphology.

The vermiform appendix is possessed of four coats: (1) A serosa, continuous with and resembling that of the caput coli; (2) a muscularis, composed of (*a*) an outer sheath of longitudinal fibres, and (*b*) an inner sheath of circularly-placed fibres. The last named is rather the thicker layer of the two, but the first partakes more decidedly of muscle of the character of non-striated variety; the muscle-tissue present in the circular layer is also of the non-striated type; (3) a submucosa, similar to the general submucosa of the intestinal canal; (4) a mucosa propria, resembling that of the larger intestine, with the exception that it contains quite constantly solitary lymph follicles in varying numbers. These latter may also be present in the submucosa.

The histology of these four tunics is identical with that of the larger intestine, with the two exceptions of the greater constancy of the solitary lymph-nodes in the mucosa and the complete outer sheath of longitudinal fibres in the muscularis.

The appendix is rich in minute blood-vessels, lymphatics, and nerves, the latter being the plexus of Meissner and Auerbach. The organ is usually supplied with a meso-appendix which assumes the shape of a triangular web, having one free and two attached borders. This membrane forms the stroma supporting the vascular and nervous supply to the part. It often contains considerable adipose tissue, and sometimes lymphatic glands.

The circulation in the appendix is practically a terminal one, the great volume of blood passing to it through a single vessel; only slight collateral circulation being derived through continuity of structure with the caput coli. In the female a third source of supply is found in the appendiculo-ovarian ligament, which carries a vessel to the appendix. Lymphatic channels are distributed throughout the meso-appendix.

Relatively large nerves also course with the blood-vessels, and must be regarded as motor, sensory, and trophic. In an experiment conducted at the Hoagland Laboratory by Professor Van Cott, stimulation of the nerve supplying this part in a dog

was followed immediately by a spasm of the muscular structure, very much resembling an erection of the penis.

One more circumstance in the anatomy of the appendix, more fully treated of in another section, may be mentioned here, —*i.e.*, that the blind or distal end of the organ has normally no attachment, thus permitting free motion of the part.

Physiologically the extent of the function of the appendix is to secrete mucus. In addition to this it is capable of peristaltic movements, to a greater or lesser extent, varying with the relative proportions of its longitudinal muscular coat and its circular fibres. These cover the ground, in this respect, as far as our knowledge extends at this time.

With this review and classification of such facts concerning the organ as are at present available to us, it becomes certain that this part of the anatomy must be subject to the same great pathological laws which govern all tissues; so that it may be logically concluded that certain pathological conditions obtain here as elsewhere, and are susceptible of classification according to a definite system. Lesions of the appendix may be thus described:

(1) Hyperplasia. General anomalies of formation.
(2) Circulation disturbances; oligæmia; hyperæmia.
(3) Non-specific inflammation
  - (*a*) Catarrhal.
  - (*b*) Purulent.
  - (*c*) Fibrinous.
  - (*d*) Combinations of *a*, *b*, and *c*.
  - (*e*) Interstitial.
(4) Specific inflammation
  - (*a*) Tubercular.
  - (*b*) Typhoid.
(5) Progressive nutrition disturbances
  - (*a*) Consecutive hyperplasia of any or all of the tunics.
  - (*b*) Neoplasms
    - Carcinoma.
    - Endothelioma.
    - Sarcoma.

(6) Regressive nutrition disturbances: atrophic changes involving any or all the coats from deficient vascular or nervous supply.
(7) Foreign bodies: such as enteroliths and accidental substances.
(8) Parasites: the various intestinal micro-organisms.

That all of these various conditions do exist in the appendix has been repeatedly shown by many investigators. Each exam-

ination of the specimens derived from a series of appendicitis cases from my own clinics, made by Professor Van Cott, demonstrates many of the varieties of lesions in the above enumeration.

The one point of keenest interest in the pathology of the appendix is involved in the answer to the question, Why, if this portion of the intestinal tube corresponds so closely to the remainder of the alimentary canal, is it so much more frequently the seat of lesions than any other portion of the tube? Or, to express it in another way, Why, if the same pathological laws govern the tissues of the appendix that govern the other tissues of the body, do they assert themselves so much more frequently here than elsewhere?

There is one prime factor which, more than any other, is responsible for this fact,—to wit, that here, as nowhere else, certainly in the abdominal cavity the parts are peculiarly exposed to circulatory, and hence to nutritive disturbances. Professor Van Cott's careful examination of my specimens furnishes convincing proof that vascular and nervous lesions are potent factors to ultimate disease of the appendix. In addition to this, proof is furnished by the interesting fact that females are less frequently stricken with the disease than males; and that, as already stated, in the female sex an extra supply of blood is furnished to the appendix through the medium of the appendiculo-ovarian ligament, a fact bearing directly upon the question of nutrition.

In all of the specimens subjected to examination, thirteen in number, there was revealed the presence in the mesenteric vessels of some form or other of obstruction to the blood-current, either endovasculitis or organized thrombus, conditions which must, in the nature of the case, have long preceded the intense small round-cell infiltration, the coagulation necrosis, and purulent foci present in the walls of the appendices themselves. In several cases, in addition, a distinct neuritis interstitialis chronica supervened; in one, the hyperplastic endo- and perineurium being so abundant as to have caused extensive atrophy of the nerve-fibres.

It is indisputable that such lesions of vessels and nerves can

only result ultimately in a most profound disturbance of the appendical tissues, with lessened resistance and localized necrosis. Why the appendix, for example, should be free from the consequences of anæmic infarct, so certain in the renal and other tissues endowed with a terminal circulation, is difficult to comprehend. On the other hand, if the trophic fibres, which must exist in the nerves of the meso-appendix, be subjected to pressure through hyperplasia of their connective-tissue sheaths to the extent of causing atrophy, trophic changes must necessarily occur in the appendix itself, and will be co-extensive with the nerve lesion.

The results of vascular obstruction are directly analogous to ulcus ventriculi, dependent upon endarteritis of the gastric vessels; those of trophic nerve lesions to perforatory ulcer due to trophic nerve lesions of an extremity.

It has been already shown that the great mobility of the appendix and its mesentery render these structures liable to torsion, and it can scarcely be doubted that this stands in direct etiological relation with the vascular and nervous degeneration.

Assuming the correctness of these conclusions, it is evident that two things are possible: (1) That the real cause of the *locus minoris resistentiæ*, which admits of bacterial infection of the appendix, must be sought, not in trauma of the mucosa, but rather in trophic disturbances of the appendix resulting from (*a*) chronic vascular lesion, (*b*) chronic nervous lesion, or (*c*) both of these combined; and (2) that this trophic disturbance will be intense or moderate, depending upon the nature of these lesions. Hence, it must follow, that ulcerative processes in the appendix, while they may be increased by bacterial invasion, may, nevertheless, owe their origin to the trophic conditions. Therefore, it must always be difficult to prove that a given ulcerating process, or pus-focus in the appendix, is due to bacterial invasion primarily; and the more especially is this true when lesions of the vessels and nerves of the mesentery obtains. It would seem much more cogent reasoning to assume that bacterial invasions were made possible by the lessened resistance of the part through defective nutrition than that primary necrosis is the result of direct invasion of germs through a normal mucosa.

Reasoning from the findings in the group of specimens of diseased appendices, furnished from my own operative work, already alluded to, another source of trophic disturbances would seem to be in progressive hyperplasia of the coats of the appendix, probably due to repeated hyperæmia or chronic stasis through defective venous return.

It is not to be denied that other causes are operative in producing necrosis of the mucosa, with consequent infection, as, *e.g.*, angulation of the appendix, the presence of foreign bodies in the lumen of the parts (a very rare circumstance, however), enteroliths, etc. It may be definitely stated in this connection, however, that all efforts to establish the existence of a specific bacterium which is responsible for appendicitis have failed; and it is now known that when microbic infection occurs, it may be simple or mixed, and that several varieties of organisms may find their way into the peritoneal exudate at once. This goes far to prove the presence of other etiological causes than micro-organisms; this, in its turn, strengthens the assumption that the local disturbances of tissue-nutrition and resistance are operative to the production of the inflammation.

Consideration of the so-called chronic relapsing cases of appendicitis throw additional light upon the whole subject, not only in its pathology, but also in the practical deductions which should aid the surgeon in his decision regarding operative interference. The cases now under consideration behave in a manner entirely consistent with the macroscopic and microscopic findings. The meso-appendix is hyperplastic, and so also is the appendix itself the seat, in many instances, of progressive hyperplasia. Everywhere, in the specimens derived from this class of cases were found new-formed connective tissue; and the vessels regularly show hyperplastic changes involving sometimes all and sometimes one or two of their coats. The same lesions are observed in the nerves. Similar lesions in the liver or kidneys would be called cirrhosis. With the lapse of time there is a general tendency to progression, until, finally, that which was at first too slight to give much semeiology suddenly asserts itself with an explosion of pain, marked reflex symptoms, vomiting,

etc., followed by temperature-symptoms and other evidences of sepsis. It cannot be certainly said at just what period of the existence of the conditions present infection first occurs. That this is true is shown by the clinical fact that fever and other evidences of infection are not present in the first few hours of the attack; abundant analogy goes to show, however, that the pain, which, without exception, ushers in the attack, as well as the muscular spasm, are the direct result of the progressive nerve lesion. Admitting that these lesions do not exist primarily in the meso-appendix, it never can be known just when the trophic disturbances are to result in necrosis of some area of the mucosa; nor can the extent of the necrosis be estimated. The practical conclusion to be drawn from this is that, with the first attack, with the diagnosis reasonably certain, it may be definitely stated that a condition is at hand which may at any time assume most threatening proportions, and which must eventually result in disaster. It is entirely within reason to suppose, from this view of the subject, that small areas of the mucosa may from time to time become thus necrosed, and local infection result. What is to follow such a process will depend upon two facts: (1) The amount of resistance in the appendix as a whole,—*i. e.*, the general condition of its blood-supply, etc.; and (2) the potential energy or virulence of such parasites as may happen to be lurking in the lumen of the appendix at the time. It is obvious that these two points can scarcely be determined *intra vitam* with any certainty, for the reason that such clinical symptoms as pain and fever are by no means in constant ratio with the extent of lesion. From this the deduction follows that, after the first attack, an individual smitten with this form of appendicitis is never safe; and in this connection it should be remembered that during such attacks adhesions may be formed which not only tend to increase the lesion in the meso-appendix, but may very seriously modify the operative possibilities. From this point of view, as well as from every other consideration founded upon our present knowledge of the disease as a whole, it is far more logical to proceed at once, under proper aseptic and antiseptic precautions and skilful technique, to remove the appendix, thus avoiding the con-

stant danger of fatal general infection, on the one hand, and serious difficulty in removing the appendix itself because of delayed operative interference, on the other.

Of the circulatory disturbances in the appendix it may be further said that oligæmia will supervene where progressive obliterating endarteritis is at hand, or where torsion is severe, or where a foreign body is present in the lumen of the tube; while hyperæmia may originate either from torsion upon the vein or, secondarily, as a result of local infection. Both conditions may undoubtedly obtain as a result of nerve lesion. That these conditions may produce effects upon the vitality and resistance of the appendix has already been shown.

In speaking of non-specific inflammation, it is not intended in this connection to convey the idea that bacteria plays no rôle in the process, for it is beyond dispute that they always do. The point here lies in the effort to discriminate between appendicitis resulting from such organisms as tubercle bacilli and those forms of the disease in which several pyogenic organisms seem equally competent to produce the inflammatory condition, and do so in conjunction with the trophic changes.

Summing up all the facts at our command, it is evident,—

(1) That appendicitis results primarily from circulatory and nervous disturbances which greatly lower the resistance of the part; and that the vascular and nervous disturbances are due either to immediate torsion of the meso-appendix or chronic progressive hyperplasia of the same.

(2) That the nature of the inflammation in the given case will be, (*a*) catarrhal, (*b*) purulent, (*c*) fibrinous, (*d*) a combination of the above named, or (*e*) interstitial. These, in turn, will depend upon the degree of circulatory and nervous disturbance, and upon the nature of the micro-organisms present.

(3) It can now be certainly shown that, in the given case of acute appendicitis, this initial attack is resultant from sudden torsion, and is not the first warning of a chronic infective meso-appendicitis, with progressive trophic lesions of the appendix.

(4) Weighing the chances of general infection of the peri-

Plate II.

Fig I

Fig II

Fig III

Fig IV

Fowler on Appendicitis

DRAWN FROM NATURE BY F. A. DECK.

toneum, or of the system at large, engendered by delay, with those of infection from a properly-conducted operation, the decision, from a pathological stand-point, must be in favor of early operation.

Of the pathological anatomy of the appendix, aside from inflammation, there are a few points of diagnostic value.

The nature of certain progressive and regressive nutritive disturbances has already been discussed. Of the neoplasms, it is to be remembered that carcinoma, endothelioma, and sarcoma have been observed. While there have been too few cases on record as yet for statistical purposes, the possibility of a real neoplasm must always be a factor in the diagnosis of appendicitis.

Of foreign bodies popularly supposed to find entrance into the appendix, it is generally admitted that this only seldom occurs. Fæcal impactions are more common, but even these are only present in a relatively small number of cases.

[TO BE CONTINUED.]

PLATE II.

ILLUSTRATING SOME OF THE CHANGES OBSERVED IN ACUTE APPENDICITIS.[1]

FIG. 1.—Acute and rapidly progressive appendicitis, with gangrene and perforation.

FIG. 2.—Interior of the same; the mucous membrane of the appendix at its middle is in a gangrenous condition; at the proximal and distal portions beginning necrotic changes are observed.

FIG. 3.—Acute perforative appendicitis.

FIG. 4.—The same, showing gangrene of the entire mucous membrane lining the organ.

[1] These colored sketches were made by the artist from the fresh specimens immediately after removal.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 10, 1894.

ROBERT ABBE, M.D., President, in the Chair.

CYST OF THE PANCREAS.

DR. CHARLES MCBURNEY presented a patient with the following history: Male, thirty-four years old; was admitted to the Roosevelt Hospital October 25, 1893. Free drinker. History of imperfect digestion for past four years. Six months ago the patient became suddenly ill with epigastric pain, vomiting, constipation, and chills. Pain continued for six weeks, the stools became white, there was entire loss of appetite with great weakness. The loss of weight during this period was thirty pounds. A swelling appeared in the epigastrium, which subsequently decreased, and for a few weeks marked general improvement was noted. In August last there was a renewed attack of illness with fever, diarrhœa, and marked jaundice. The patient entered the hospital on the medical side, and was for five weeks under careful observation. His symptoms continued as before and no positive diagnosis was reached. When he came under the care of Dr. McBurney the abdomen was distended and the muscles were very rigid. To the right of the median line, at about the usual situation of a distended gall-bladder, could be felt a rounded tumor. Abdominal distention prevented accurate palpation. Just below the edge of the liver a transverse depression between the liver and the tumor was noted. Diabetes to the extent of ten grains to the ounce existed. Diagnosis doubtful,—either gall-bladder distention or pancreatic cyst.

Operation October 25, 1893. A vertical incision at the upper part of the right edge of the rectus muscle was made. The omentum covered the tumor. The transverse colon was seen just below it and the duodenum was recognized at the right. After the hand was introduced into the abdomen the large size of the tumor, some eight inches in diameter, and its situation, reaching far to the left, rendered the diagnosis of pancreatic cyst probable. The peritoneal

coverings were torn through over a small area, exposing a smooth tense cyst. Suture of the peritoneum to the wound edges and packing with iodoform gauze were made to prepare the uncovered portion of cyst-wall for incision.

Incision was made at the end of the three days and about three pints of yellowish fluid evacuated. The margins of the opening were then sewed to the skin and a drainage-tube was introduced. Examination of the fluid by Dr. Hodenpyl at the College of Physicians and Surgeons showed it to be sterile pancreatic secretion. Recovery was uneventful. The patient has now gained eight pounds, and is much stronger, though still weaker than normal. The stools are normal. Diabetes is still present and indigestion after eating continues. A sinus about four inches long still exists which discharges a very little fluid.

While replying to some questions regarding his case, Dr. McBurney expressed the opinion that there had been, if one could judge by the reports of cases, somewhat too much freedom shown in opening into pancreatic cysts at the first operation, although the results seemed to have been satisfactory. He had resorted to the double operation by preference, and it seemed to him that where there was no great urgency because of acute symptoms the method of making the incision secondary to attaching the cyst to the walls and the formation of adhesions was a good one.

As to whether the cyst was presumably a dilatation of a duct or was an independent cyst within the gland, he did not know whether that point could be positively determined. His impression was that most such cysts had been formed in some portion of the duct. Very often it was a radicle which had become distended, displacing the gland mass. He thought it would be difficult to determine whether in his case the cyst had started by dilatation of a radicle of a duct or in some part of the gland-structure proper.

DISLOCATION OF THE HUMERUS COMPLICATED BY FRACTURE AT OR NEAR THE SURGICAL NECK, WITH A NEW METHOD OF REDUCTION OF THE DISLOCATION.

Dr. Charles McBurney read a paper with this title. (See page 399.)

Dr. Abbe expressed his pleasure at hearing a surgical procedure described in the paper which lifted another class of cases out of the

list of those which had been generally accepted as inoperable and hopeless. Only one case of dislocation of the humerus complicated by fracture at the surgical neck had come under his observation. It occurred in a fat woman who was sent him by a physician nearly three months after dislocation at the shoulder, the physician himself having failed to effect reduction after a vigorous attempt made at this late date under ether. With the patient standing against a door, Dr. Abbe examined and manipulated the arm according to the Kocher method, attempting to place the hand on the opposite shoulder, and so on, and during this simple procedure something was heard to snap. It proved to be the humerus near the surgical neck, which, doubtless, had already become porous and atrophied during the few months' dislocation. He would have been very glad indeed to have been acquainted at the time of this accident with the method which Dr. McBurney had brought forward this evening. A large number of cases of fracture near the neck of the humerus have been reported in connection with the effort to reduce old dislocations, and it is in this class that much comfort will be taken by the surgeon in having so satisfactory a method of reducing the bone added to his resources. It will be necessary, he supposed, to avoid much injury to the soft parts in cutting down upon the head of the bone lest necrosis should occur through interference with the circulation.

Dr. L. A. STIMSON regarded Dr. McBurney's paper as one of the most important contributions to traumatic surgery made within our time, for his operation is a simple, safe, and efficient means of treating an injury that has heretofore been practically beyond the resources of surgery. The injury is a rare one, but we can judge of its gravity and of the great superiority of Dr. McBurney's method by considering the alternative measures that have been in use. This complication has been the subject of several papers or discussions within the past few years. Only last spring, Sir William MacCormac read a paper before the Congress at Paris, in which he advocated the propriety of proceeding at once to excision of the upper fragment in cases of this kind. Dr. Stimson thought any but an enthusiastic judgment would admit that the results of excision are not at all satisfactory. While passive movement might be very free, active movement was but slight. Yet such results were to be preferred to some of those obtained by the alternative measure of leaving the fragments to unite, perhaps, at more or less of an angle, the head in an abnormal position, provoking pain by certain movements.

He had had opportunity to examine Dr. McBurney's patient four or five months after the injury. The result was as good as that usually obtained in a case of simple shoulder-dislocation with prompt reduction. The only trace of the injury was a slight limitation of abduction, perhaps ten degrees.

Dr. JOSEPH D. BRYANT stated that his own experience which had any bearing upon the subject had been limited to but one case. A lady was thrown violently from her carriage; the upper arm, it seemed, struck against an iron rod, which was found to be very much bent by the blow; dislocation of the shoulder resulted, and was afterwards supposed to have been successfully reduced. She came under Dr. Bryant's observation three months after the accident, and at that time he found the shoulder dislocated. He attempted to effect reduction by Kocher's method, but failed after fifteen minutes' painstaking efforts. He then waited ten days, and tried again, by the same method, this time, as he supposed, with success. He then bound the arm in position, but found, when swelling had subsided, that it was in substantially the same position which it occupied when the second attempt at reduction was begun.

She was suffering from the characteristic symptoms of pressure from dislocation of the head, and from consequent exudation, so that incision into the joint and exposure of the head of the bone was thought to be indicated. When the parts were exposed, he found, with the arm resting at the side, that the greater tuberosity was three-quarters of an inch higher than the upper limit of the articulating surface of the humerus, the head itself had been driven downward, and was firmly united to the inner surface of the shaft. This relation of the parts, he thought, easily accounted for the difficulty of reduction in the first instance, and for the deception which attended his second attempt at reduction. The greater tuberosity having come in contact with the acromion process misled him in the view that the head of the bone had been reduced. Only a partial reduction was possible under these circumstances, and this was transient.

What remained of the capsule was found attached to the posterior surface of the tuberosity. The head of the bone, situated below the tuberosity, was pressing against the nerves. Whether to saw off the projecting portion, which would imply also removal of the capsular attachments, or to remove the head of the bone was, at first, somewhat of a puzzle. He decided to take off so much of the head of the bone as would relieve pressure, and enable him to place it as

nearly as possible in its proper relations to the glenoid cavity, although, of course, it remained in abnormal relation to the remaining portion of the humerus, rather than to remove the great tuberosity, and along with it the remaining capsular connections. He feared that if the latter course were adopted the head of the bone would not remain reduced, owing to the muscular contraction resulting from the long displacement, and the additional tension of these muscles caused by the abnormal raising of their points of insertion due to restoration of the displaced articular surface. Thus far the result had been satisfactory; the pain and numbness in the fingers had been much relieved, the patient having been suffering from pressure neuritis.

Dr. F. W. MURRAY said that he was present at the operation described by Dr. McBurney, and had assisted him. The patient was a large man; the tissues were much swollen, owing to the nature of the injury and frequent handling, so that it seemed to the speaker that it would be very doubtful whether reduction could be effected. The incision was a small one; the damage thus done the soft parts was practically none. After the hole had been bored into the bone, and the hook inserted, it became evident at once that the operator had complete control of the upper fragment, so that the reduction was effected as easily as he had ever seen it done, after a simple dislocation.

Dr. CHARLES K. BRIDDON stated that he had seen but a single case of fracture complicating dislocation of the humerus. It occurred in a man who had been treated for fracture of the surgical neck of the humerus by immobilization for five or six weeks. When the immobilizing apparatus was removed it was found that he had a dislocation as well as a fracture existent. Dr. Briddon saw the case the next day and found the head of the bone immovably fixed beneath the coracoid process; no movement of the shaft could be made to affect the head of the bone. In that case he advised making an opening large enough to admit the insertion of a long carpenter's screw and an attempt to make reduction by traction on the same. He was not, however, permitted to make the attempt, and supposed the dislocation remained unreduced. He had made up his mind to try the method should another case ever fall into his hands, but since learning of Dr. McBurney's method he would now apply it as a better one. He supposed there might be some danger of the instrument tearing out if it were inserted into the head, as this portion of the bone was more friable than the portion below.

Dr. McBURNEY remarked that he had been surprised to learn, through his experiments, that the power which he could apply in making attempts at reduction of dislocations was much less than he had formerly believed to be the case. Measured in pounds, the amount of power which one ordinarily applied in pulling upon the limb was not at all great. Being himself muscular, he had supposed he could, if it were necessary, pull as much as 200 pounds, but he found that to hold 100 pounds for five seconds was a considerable effort even when having hold of a handle which gave one the best possible grasp. Equally favorable conditions did not ordinarily exist in surgical practice.

HYPERTROPHIED MAMMARY GLAND IN A BOY.

Dr. JOHN A. WYETH, being unable to be present, sent a patient who was presented by the president. A school-boy, fourteen years of age. When eleven years old his left mammary gland began to enlarge, attaining the size of an adult fist. The enlargement or growth of the gland then ceased and remained stationary in size until the past November. It then began to rapidly grow, and at date of operation was double the size of an adult fist. The gland was rounded and symmetrical in proportions. It so closely resembled the breast of a fifteen-year-old girl that a surgeon present requested an examination of his genitals to make certain no anomaly of sex existed. The breast was removed under ether and submitted to the pathologist, who reported it to be a pure and unmixed hypertrophy of the gland. There was no limiting membrane to define a tumor, but instead the whole gland had taken on an abnormal growth, just what would be the physiological development in the gland of a female of his age.

HYDRONEPHROSIS; NEPHRECTOMY.

Dr. FRED. KAMMERER presented a kidney removed from a woman of twenty-five years, who had been suffering off and on for nine years. She was accustomed to have pain in the left side, which sometimes became very acute so that she had to lie down. During the last three years, while she was under the care of a competent practitioner, nothing abnormal was found in the urine except that at the time of one of her paroxysms of pain the urine contained blood. It was about two years ago that a tumor was first noticed in the abdomen. This became smaller again, and finally could not be recognized.

When Dr. Kammerer saw the patient for the first time, about two months and a half ago, it was very easy to detect in the left side of the abdomen a tumor, about the size of a child's head. It was distinctly fluctuating, and had already been made out with considerable certainty to be a tumor of the kidney. Taking everything into consideration, it was judged to be a hydronephrosis, in all probability intermittent. The only point of doubt was the cause. A week or two later the tumor was only half as large as it had been, and on the day when it was proposed to operate it had almost entirely disappeared. Nevertheless, a lumbar incision was made and the sac extirpated. In the specimen can be seen the pelvis of the kidney dilated, the kidney proper subdivided into four or five sacs, and each of these sacs communicating through a small opening with the distended pelvis of the kidney. Recovery was rapid and uneventful.

SPECIMENS OF APPENDICITIS.

Dr. Charles McBurney presented a vermiform appendix with the following history: The patient, an adult male, had a very acute attack of appendicitis, beginning at the end of April last. An abscess formed which was allowed to remain undisturbed for a month, at the end of which time it had reached a large size. On May 23 the abscess was opened by a free incision close to and parallel with the outer part of Poupart's ligament. At the end of a month the abscess healed. After the operation the patient continued to have fever, and even after the wound healed fever did not disappear, the temperature varying from 99° to 101° at different times in the day, sometimes being highest at night and sometimes in the morning. Malaise to a disabling degree and moderate pain on motion at the usual situation of the appendix, together with fever, continued from August last up to the first examination of the patient, three weeks ago. The general condition of the patient as regards appearance and weight was excellent. Examination of the abdomen revealed no tumor or induration, but deep pressure with a single finger over the usual situation of the appendix always demonstrated the existence of tenderness. Some remnant of a diseased appendix or small encapsulated abscess was suspected to be present. On opening the peritoneal cavity a large mass of omentum covered the seat of the appendix. Dividing this, the entire appendix was found in its usual situation. Its base appeared to be nearly normal. Three-fourths of an inch away from the base a considerable dilatation of the appendix, about one-half

inch in diameter, existed. This was adherent at a single point to the caput coli. The base was ligated and the point of adhesion cut through, and, as was suspected, the sac was found to communicate with the colon. The sac was filled with old pasty fæces. No doubt septic absorption had been going on and fever consequently existed. The appendix was removed and the pathological opening into the colon closed with suture. The abdominal wound was sutured throughout. The patient made an uninterrupted recovery, and fever has since remained entirely absent. It is clear that perforation of the appendix at the point which afterwards became adherent to the intestine took place early and caused the abscess. Adhesion to the intestines then occurred and partial drainage into the intestine. The abscess thereupon healed, but imperfect evacuation of the fæcal collection in the appendix caused fever and prevented complete restoration of health.

This case illustrates the fact that the opening of an abscess due to perforation of the appendix does not necessarily cure the patient; portions of the appendix, and even concretions, may remain behind and give rise to further disease. Such cases go to prove that early operation in cases of suppurative appendicitis, done at a time when all diseased tissue can be removed, is to be preferred to the late operation of opening the abscess.

Dr. L. S. PILCHER presented a specimen illustrating some points in chronic relapsing appendicitis. The patient was a man some thirty years of age, who had had his first attack of trouble at the appendix about three years previous; at the end of a year he had a second attack, after another six months a third attack, and then at intervals of about six weeks three more attacks. Until the last attack, which confined him to bed six weeks, the attacks had been brief. He was brought to the Methodist Hospital in Brooklyn after having about recovered from his last acute attack for the purpose of submitting to an exploratory operation; there still remaining tenderness at the site of the appendix with slight evening rises of temperature. On section the appendix was found lying along the brim of the true pelvis, to which it was adherent, being covered in by the cæcum and ileum which were adherent to it. There was a dilated club-shaped distal end of the appendix which opened into a small cavity lying between it and the ileum, and this cavity in turn opened by an oblique canal into the ileum, so that there was a communication between the dilated terminal portion of the appendix and the ileum, but no communication between the terminal portion of the appendix

and the cæcum. The cavity between the appendix and ileum formed a small abscess. The appendix was removed; the opening into the ileum was with some difficulty brought into view and closed in with Lembert sutures. An iodoform drain was introduced. The patient has made an uneventful recovery.

Dr. CHARLES A. POWERS presented, for purposes of comparison, two specimens of perforating appendicitis. The first was the appendix from a woman twenty-two years of age. She had had one previous attack of appendicitis, which lasted about a week, and ended in resolution. At about five o'clock in the morning of December 2, she was awakened from sound sleep by pain radiating from the navel over the abdomen; there was a good deal of vomiting. Her physician saw her at 9 A.M. The temperature was 100° F. She continued to vomit during the day. At 6 P.M., the temperature was 103°; pulse 120; abdomen about as it was found in the morning,—tender and somewhat distended. She was seen by the reporter at ten the next morning. The temperature was 101°; the respiration 30; pulse 120; abdomen only moderately distended; nothing special felt in the iliac fossa; no special tenderness in that region; the face was anxious. Perforative appendicitis, with probable peritonitis, was diagnosticated, and an immediate operation was performed. The appendix was found absolutely free from adhesions; but there was a minute perforation in its wall; the abdomen was full of thin pus,—on the left side as well as on the right. It was washed out as thoroughly as possible with water at the proper temperature, which had been boiled,—several gallons being used; the patient died twenty hours afterwards.

The second specimen was obtained from a man thirty-eight years of age, who had had an indefinite history of six or eight previous attacks of mild appendicitis during the previous two years. The present acute attack began at 10 P.M. on December 28 last. The pain radiated from the navel over the abdomen. The temperature was 99.5°; pulse 70. The pain became severe, and the patient received three-quarters of a grain of morphine during the next three hours. At 9 A.M. next day the temperature was 99.5°; pulse 74; he had vomited once. In the afternoon there was much pain, which had tended to settle in the right iliac fossa. At 7 P.M., twenty-one hours after the onset of the symptoms, he was seen by the reporter. The temperature was then 100.5°, by the mouth; pulse 84; slight tenderness in the right iliac fossa, but no induration; abdomen considerably distended. The patient was a stout man. There was, perhaps, as much tenderness

on the left side of the abdomen as on the right. As a physician lived in the house with him, it was thought best to wait a few hours before operating. At 11 P.M. he had a very severe chill, which lasted fifteen minutes, followed by a temperature of 103°, per rectum. As soon as possible thereafter the abdomen was opened, Dr. W. T. Bull operating. On opening the abdomen a tense, hard mass was encountered in front of the cæcum; under this an induration was felt in the right iliac fossa, about the size of a flattened apple, surrounded with very dense adhesions. There was no evidence of general peritoneal infection. On unravelling the mass, which consisted of old inflamed, densely-thickened omentum, the appendix was found to have a large perforation with gangrenous edges; its mesentery much thickened. The patient recovered.

In comparing the two cases one finds the symptoms, during the first twenty-four hours, practically the same in both, with the exception of the pulse. In the case of general peritonitis the pulse was 120; in the other it was 84, at about the end of twenty-four hours; the abdominal distention was the same; so were the indications in the right iliac fossa. In the first case, perforation into the general peritoneal cavity, with diffuse, suppurative peritonitis; in the second case, gangrene and perforation, limited slightly behind; limited in front by dense adhesions.

It may be said that the first case would have recovered had operation been done twelve hours earlier. Had the operator seen the patient at that time he would, doubtless, have operated then, yet it is by no means certain that she would have recovered even then. The perforation, which was no larger than a bristle, probably took place at the onset of the pain, at which time infection of the general peritoneal cavity took place.

Twelve hours probably sufficed to set up a peritonitis, which was practically irremediable.

How, in such a case as this, is a diagnosis of perforation to be made during the first few hours after the initial pain? We are hardly to open the abdomen at the very beginning of every attack of belly-ache, and so, perhaps, it is inevitable that we are going to lose, for the present, such cases as this.

INDEX TO SURGICAL PROGRESS.

HEAD AND NECK.

Two Cases of Linear Craniotomy in Microcephalus. By CLAYTON PARKHILL, M.D. (Denver.) The first patient, a boy, aged four years and eight months, was a hopeless idiot. He was restless and walked about continually in a stooping posture with irregular, uneven gait. The saliva dribbled from his mouth and he sucked his thumb. His facial expression was blank and he continually uttered an idiotic cry. His attention could not be held on any object, and he would not play continuously with anything. He could utter two or three syllables, which his parents could interpret as meaning certain things, but which no stranger could possibly understand as words. His head was markedly microcephalic and conical, owing to the lack of development of the frontal and parietal eminences. October 9, 1891, craniotomy was done, a section of the cranium was removed, three-quarters of an inch wide, and six and a half inches long, on the right side, three-quarters of an inch from the median line, and extending from the anterior hair line, that is midway between the parietal eminence and the sagittal suture, to within an inch of the inion. Ten weeks later the left side was operated on in a similar manner, with the addition of a bone incision an inch and a half long by a half inch wide, extending downward toward the ear from the middle of the long bony wound. Recovery from both operations rapid and uneventful. At the end of five months a marked improvement had occurred in his mental condition. No longer stoops, has stopped dribbling, rarely puts thumb in his mouth, still has slight convulsions, one every two weeks, displays a degree of intelligence equal to most children of his age, and has made much progress in talking.

The second case, a girl, five years and nine months of age, was

likewise a complete idiot, but her skull was in appearance megalocephalic rather than microcephalic. This was found to be due to the great thickness of the cranial bones, which along the line of operation were from one-quarter to one-third of an inch thick.

May 19, 1892, craniotomy was done as in the previous case, the length of the bone incision being fully eight inches. The recovery from the operation was uneventful. Already, within a few weeks after the operation, when the report is made, the author notes decided improvement in intelligence.

A report of the results noted after the lapse of a much longer time would greatly increase the value of these reports.—*International Medical Magazine*, November, 1893, p. 896.

BONES—JOINTS—ORTHOPÆDIC.

Final Results in Tubercular Ostitis of the Knee. By V. P. GIBNEY, M.D. (New York). The author has records of 499 cases of tubercular ostitis of the knee, observed between the years 1868 and 1887. Three hundred of these cases have been traced to the present time, and final notes of their condition constitute the basis of this report.

Sex.—223 females; 276 males.

Side.—In 239 cases the right knee was affected; in 235 it was the left; in 25 the side is unrecorded,

Age when disease developed.—In 197 out of 387 cases, or nearly 51 per cent., the disease developed before the age of five years; in 142, or 36 per cent., between the ages of five and ten. In 39 cases, or about 10 per cent., between the ages of ten and twenty years; in 9 cases, about 2 per cent., after the twentieth year had been passed.

Involvement of other joints.—Of 499 cases there were only 16, or 3 per cent., in which other joints or bones were involved. Of the 16, 8 had spondylitis; 2 ostitis of the hip; 1 ostitis of the ankle; 1 disease at the elbow; 1 disease of the wrist and shoulder;

2 affections of the other knee; and in 1 the other knee, an elbow and a shoulder were also involved.

Abscesses.—Of 300 cases, 140 (46 per cent.) had abscesses.

Mortality.—Of 300 cases, 40 have died; 6 of tubercular meningitis, 14 of exhaustion after prolonged suppuration, 3 from phthisis, 2 from dysentery, 2 from amyloid degeneration, 12 from intercurrent affections not connected with the disease, and 1 from shock following excision. Assuming that 22 of these deaths are attributable to the disease, the mortality is 7⅓ per cent.

Treatment.—Three forms of treatment have been in use: (1) The purely *expectant*, involving treatment of symptoms, relief of exacerbations, irregular use of apparatus, or frequent changes of apparatus; (2) the *fixation* treatment, involving the continuous use of apparatus, partially or completely immobilizing the joint, including also various forms of extension apparatus; (3) the *protective*, meaning thereby immobilization of the joint until all acute signs have subsided and convalescence is assured, and the use of apparatus efficient to prevent concussion, or jar, or tremor of any kind. The apparatus chiefly used by the reporter for this purpose has been the "Thomas" knee splint.

Although it is impossible to draw a sharp line of division between these groups, still the reporter thinks the distinctions may be sufficiently drawn to admit of generalizations. His conclusions are as follows:

Expectant Plan.—Number of cases, 60; abscesses, 23 (38 per cent.). Of these 23 abscess cases, 14 recovered with motion in the joint; 9 were pretty firmly ankylosed. Of the 37 non-suppurating cases, 30 recovered with motion, 7 were ankylosed. In all 44 (60 per cent.) recovered with motion.

Fixation Plan.—Number of cases, 145; abscesses, 63 (43 per cent.). Of these 63 abscess cases, 43 recovered with motion, 20 became ankylosed. Of the 82 non-suppurating cases, 70 had motion, 12 were ankylosed. In all 113 (77 per. cent.) recovered with motion.

Protective Plan.—Number of cases, 37; abscesses, 19 (about 50 per cent.). Most of these, however, had abscess before the treatment was begun. Of these 19 abscess cases, 16 recovered with motion; 3 were ankylosed. Of the 18 non-suppurative cases all recovered with motion. In all 34 (95 per cent.) recovered with motion.

Amount of Motion Preserved.—In 16 of the cases in which abscess occurred motion over an arc of more than 90° was preserved. In the non-suppurating cases 25 could be voluntarily moved over an arc of 90°.

Relapses have been infrequent. Of the abscess cases only 4 relapsed during periods varying from seven to twenty years. Among the non-abscess cases 6 relapsed.

Need of Continued Support.—Fourteen (4½ per cent.) of the abscess cases and 22 (7 per cent.) of the non-abscess cases continue to wear some kind of support; that is, 12 per cent. of the entire 300 cases seen.

Deformity.—Out of 200 cases, in 2 there was complete luxation of the tibia, in 150 sub-luxation and in 48 no sub-luxation. Out of 227 cases, 71 could extend their limbs to an angle between 175° and 180°; 141 to an angle of not less than 165°; and 15 got well with deformity at an angle under 135°. The protective treatment gave the largest percentage of good results, so far as position is concerned, the fixation next, and the expectant the smallest percentage.

Epiphyseal Lengthening.—Of 116 cases measured, in 6 there was a lengthening of one inch; in 15 three-quarters of an inch; in 34, half an inch; in 17, quarter of an inch. That is to say, there was a relative increase of length of the femur in 62 per cent. of the cases.

Excisions.—Fourteen were subjected to excision. Three of these recovered with an angle of 160° or less; 6 at 170°; and 3 at 180° (perfectly straight). In 2 the deformity is not known. In 1 there is a half-inch shortening; in 1, one inch; in 2, two inches; in 1, two and a half inches; in 1, three inches; in 1, three and a

half inches; in 2, four inches; in 1, eight inches; and in 4 the result is unknown.

The author believes that the teaching of his experience is against excision of the knee-joint.—*American Journal of Medical Sciences*, October, 1893.

GENITO-URINARY ORGANS.

Involuntary Resection of a Large Portion of the Urinary Bladder; Successful Reconstruction. By Dr. E. LOUMEAU (Bordeaux). In the case of a woman, thirty-five years of age, the subject of chronic inflammation of the pelvic organs, the author, in the course of an operation for removal of adherent and damaged appendages, found, on opening the abdomen, a mass of inflammatory deposit extending from the abdominal wall to the rectum, covering in entirely the ventral surface and fundus of the uterus. This was cut away with scissors; the freed uterus was then drawn forward and, after the appendages had been removed, was sutured to the anterior abdominal wall. The abdominal wound was then closed. Before sending the patient to bed, however, a catheter was introduced into the bladder. A few drops of blood only escaped. This awakening apprehensions that the bladder had been wounded during the operation, the abdomen was immediately reopened, when it was discovered that there had been a resection of the entire free end of the organ. The only portions remaining were that part which lies upon the vagina containing the two ureteral orifices and a small segment of the ventral wall.

Owing to the impossibility of reconstructing by suture of the remaining walls a bladder cavity as large as a thimble, Loumeau was forced to adopt the following procedure: The peritoneum was first sutured above the bladder, thus shutting off the peritoneal cavity. The fragment of the bladder which remained in contact with the uterus and the vaginal wall was dissected free with great care, drawn forward, and then sutured to the abdominal wall, thus forming a

vesico-cutaneous sac. This was treated subsequently just as in suprapubic cystotomy, using at first the tubes of Périer-Guyon. At the end of two weeks these were removed and a Malécot catheter introduced into the urethra, being changed twice a week for a period of six weeks more, when the use of the catheter was stopped. From this time micturition was through the urethra, and not more frequent than before the operation. She then gave the information that for a long time previously she had been obliged to urinate very frequently, and only passed a few drops of urine at a time; an important fact to which attention had never before been drawn.

The abdominal wound first made healed by first intention; the opening into the diminutive bladder closed by granulation. Nine months afterward the patient could walk long distances without fatigue, and all the symptoms referable to the uterus (which still maintained the position in which it had been sutured) had disappeared. Desire to urinate occurred every three or four hours, and the act was never involuntary. The bladder held easily 360 grammes of urine, an almost incredible amount when one considers the small amount of tissue available for the new bladder wall. When thus distended it bulged somewhat above the pubis, as far as eight centimetres below the navel. When the patient urinates she is obliged to bend forward and strain some at the end of the act in order to completely satisfy the desire to make water. This is because of a cicatricial band which stretches across the bladder wall and prevents the organ from being entirely emptied in the usual way.

The piece of the bladder which was cut away was triangular and covered by a thick layer of false membrane.—*Chirurgie des Voies Urinaires, par E. Loumeau.*

H. P. DE FOREST (Brooklyn).

REVIEW OF BOOKS.

CHIRURGIE DES VOIES URINAIRES. Etudes Cliniques par le Dr. E. LOUMEAU. Second edition, revised and enlarged. Five chromo-lithograph plates. Bordeaux: Feret & Fils, Libraires-editeurs, No. 15 Cours de L'Intendance, 1894. (Surgery of the Urinary Passages.)

For the surgeon who is interested in recent developments in genito-urinary surgery this work is of value. It is a compilation of the various reports published by the author since 1891; some of them have already appeared in pamphlet form.[1] The cases are given in chronological order as they came under the author's care, and in every instance the previous history of the case, the details of the operation, if one was performed, and the subsequent results are minutely given.

Dr. Loumeau has not hesitated to give an account of his mistakes with the same freedom and exactitude that he has accorded to his successes. This is illustrated by the account of a case of laparotomy, in which the bladder was not recognized, and was resected during the operation. The details of this case are given in full on page 506 of the present number of the ANNALS OF SURGERY.

Many interesting accounts are given of conditions demanding surgical interference, involving various parts of the genito-urinary system. Kidneys, ureters, bladder, prostate, and urethra, all furnish material for the book, and among the pathological changes found are all of the common diseases of these organs, as well as many extremely rare forms.

[1] Chirurgie des Voies Urinaires, Etudes Cliniques. Bordeaux, 1892: Feret & Fils. 8vo, 70 pages.

Among these latter may be mentioned a case of perinephritic abscess, which opened externally through the bronchial tubes; a case of stricture of the urethra in the female in which an internal urethrotomy had to be performed, and a remarkable case of a calculus in the urethra.

A number of cases of cystitis of gonorrhœal origin in which the treatment was by means of sublimate instillations are described in full.

Besides the mere clinical account, each of the chapters is made more valuable by the historical references, and by the bibliography of the subject, which are given. Five colored plates illustrate some of the rarer conditions found.

The author's style is clear and concise; the various topics are well classified; the arrangement is very systematic; altogether the book is a model for the presentation of clinical studies.

H. P. DE FOREST.

ANNOUNCEMENTS.

AMERICAN SURGICAL ASSOCIATION.

THE Annual Meeting of the American Surgical Association will be held in the Lecture Room of the Medical Department of the Columbia College, 1325 H Street, N. W., Washington, D. C., May 29, 30, 31, and June 1, 1894, from 10 A.M. to 1 P.M. each day.

SPECIAL SUBJECTS FOR DISCUSSION.

I.—*The Surgical Treatment of Empyæma*, to be introduced by a paper by John Ashhurst, M.D., Philadelphia, to be followed by Drs. N. Pendleton Dandridge, Cincinnati, Charles B. Nancrede, Ann Arbor, T. F. Prewitt, St. Louis, and DeForrest Willard, Philadelphia.

II.—*Methods of Teaching Surgery*, to be introduced by a paper by John S. Billings, M.D., U. S. Army, to be followed by Drs. John C. Warren, Boston, Nicholas Senn, Chicago, William W. Keen, Philadelphia, E. M. Moore, Rochester, W. T. Briggs, Nashville, and Hunter McGuire, Richmond.

III.—*The Surgery of the Kidney*, to be introduced by a paper by Louis M. Tiffany, M.D., Baltimore, to be followed by Drs. M. H. Richardson, Boston, H. H. Mudd, St. Louis, C. H. Mastin, Mobile, and J. F. Thompson, Washington.

IV.—*Methods of Controlling Hæmorrhage in Amputation at the Shoulder*, to be introduced by a paper by William W. Keen, M.D., Philadelphia, to be followed by Drs. R. Park, Buffalo, C. B. Porter, Boston, and J. William White, Philadelphia.

J. EWING MEARS, M.D., *President.*

J. R. WEIST, M.D., *Secretary.*

GERMAN SURGICAL SOCIETY.

THE Twenty-third Congress of the German Surgical Society, in view of the International Medical Congress in Rome, will be held in Berlin from the 18th to the 21st of April, inclusive.

The welcoming of the members will take place on April 17, in the evening, at the Hôtel de Rome, Charlottenstrasse, No. 44, beginning at 8 o'clock.

During the course of the Congress the morning session will be held from 10 to 1 o'clock, and the afternoon session from 2 until 4 o'clock, in the large audience hall of the Langenbeck House.

The following three topics are made known in advance for general discussion:

(1) Bruns (Tübingen) will begin the first day with a paper on "The Result of Conservative Treatment in Tuberculous Inflammation of the Hip-joint."

(2) Küster (Marburg) will open the second day of the session with an introductory paper on "Early Operation in Osteomyelitis."

(3) Von Bardeleben (Berlin) will begin the third day with a paper on "The Early Movement of Broken Limbs, with Especial Consideration of the Lower Extremity."

In accordance with the resolutions adopted at the Twenty-first Congress, the collective observations of the members concerning anæsthetization will be presented in order to bring together as large an amount of information upon this subject as possible. In these reports the following points will be given especial attention:

(1) The period over which the observations extend.

(2) Which anæsthetics (chloroform, ether, mixtures of the same), and how each particular one is used.

(3) Source of supply of the same.

(4) Apparatus, etc., employed.

(5) Observations of narcosis of unusual length,—one hour and over.

(6) Consumption of anæsthetic per minute, or the average for each narcosis, or maximum consumption in narcosis of unusual length.

(7) Whether, and in what amount, the injection of morphine was employed.

(8) Accidents occurring through narcosis: (*a*) Asphyxia (treatment, tracheotomy, etc.); (*b*) deaths (causes, results of autopsies, etc.).

PROF. DR. F. v. ESMARCH,

Chairman for the year 1894.

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ON TRAUMATIC RUPTURES OF THE URETER, WITH REPORT OF A CASE OF RUPTURED URETER FOLLOWED BY NEPHRECTOMY IN A CHILD.

By HERBERT W. PAGE, M.C. (Cantab.), F.R.C.S. (Eng.),

OF LONDON,

SURGEON TO ST. MARY'S HOSPITAL; EXAMINER IN SURGERY, UNIVERSITY OF CAMBRIDGE.

POSITION, mobility, and size combine to protect the ureter from injury, and it is well known that rupture of it is a lesion of the greatest rarity. Nevertheless there are a few cases on record which show that the ureter is not exempt from the possibility of rupture in abdominal injury without external wound, and that there are certain fairly uniform symptoms whereby correct diagnosis may be made. I propose in this paper to examine the cases which have been recorded, but shall, first of all, give an account of a case which was recently under my care, and in which it became necessary to remove the kidney on the affected side.

On September 24, 1892, Charles N., aged five years, was knocked down and run over by a light vehicle, the wheel of which was said to have passed over his abdomen. He was brought to St. Mary's Hospital, but there was no evidence of serious injury, and he was sent home. On the 26th, however, he was brought back and admitted because his parents had noticed that on three separate occasions there was blood in his urine. Once there had been a small clot passed at the close of micturition, and twice had blood in very small quantity been mixed with the urine. The child had been bruised in many places, but that of which he most complained was abdominal tenderness. There was no mark of abdominal contusion. As his evening temperature stood between 100° and 102° F., and as the tenderness seemed to be especially marked in the right iliac fossa, my colleagues, Mr. Silcock and Dr. Lees, held a consultation about him, for the site of the tenderness, and the suspicion of some swelling also, rather

pointed to trouble in the region of the appendix vermiformis. Nothing very definite, however, was discovered. His bowels were cleared out by enema, and with good result, for the temperature fell to normal, and the abdominal tenderness disappeared. The urine was at this time in every respect normal, and it did not occur to any one that either kidney, ureter, or bladder had met with injury. He came under my own care on my return to the hospital, October 1, and during the next fortnight had a normal temperature, was free from pain, and was generally so well that I took his case as the text of a clinical lecture on intra-abdominal injuries without external wound, and as one in which the course of events had so far shown the propriety of abstaining from operation. On October 14, however, twenty days that is after the accident, the evening temperature had gone up to 100° F., and on the 17th to 103° F., while there was a marked return of abdominal tenderness. There was also decided swelling with dulness on percussion in the right iliac fossa, and this unquestionably showed a tendency to increase during the next few days. Abdominal tenderness and impaired movements in respiration were also more noticeable, and the temperature on the 23d, 24th, and 25th was as high as 103° F. The urine was normal in every respect, but no measurement of the daily quantity was made at that time.

Up to this point there was nothing in the history or symptoms, with the solitary exception of the transient hæmaturia, to lead to the suspicion of ruptured ureter; but inasmuch as the temperature continued high and the swelling to increase, with obviously greater abdominal tenderness and impaired respiratory movements, together with manifest failure in the child's general condition, it was resolved to explore the tumor by an opening through the abdominal wall. Of the swelling itself, it may here be said that it had certainly increased from below upward, that it was uniformly dull on percussion, occupied the right iliac fossa almost as far as the middle line, and that its position and characteristics were in nowise affected by change in the posture of the child. Associated with it there was undoubtedly some peritoneal effusion, which to some extent determined the exploration. Accordingly, on October 27, the abdomen was opened in the right linea semilunaris by a three-inch incision immediately over the swelling. Clear serous fluid escaped from the peritoneal cavity directly it was opened, and there bulged forward into the wound a soft fluctuant swelling the size of a large Jaffa orange. This was forthwith opened by an incision corresponding with that already made in the abdominal wall, every care being taken, by suture of the inner lip of the incision

to the parietal peritoneum, to prevent the escape of any of the fluid from the cyst into the peritoneal cavity. The peritoneal reflection could be felt a couple of inches external to the site of the opening, and it was manifest, therefore, that the fluid was entirely behind the serous membrane. The ascending colon lay to the inner side. The collected fluid measured forty ounces, and mixed with it were a few colorless clots of fibrin. The analysis of the fluid, and of a later specimen submitted to him, was made by Dr. Adler Wright, F.R.S., and is recorded below.[1]

It was now for the first time possible to explore the cavity in which the fluid had been collected. The right kidney was seen to be of normal size, and apparently healthy in all respects both to sight and touch. So also it may be said of its pelvis, in which no opening whatever could be found. Attention was therefore directed to the ureter, but in the couple of inches at its upper end exposed to view no rent or other abnormality was visible. Below this point it was no longer in view, and I deemed it unnecessary and unadvisable to dissect it out as far as the bladder, having the hope that if the fluid came, as was suspected, from a rupture in the ureter lower down, the hole in it might be small, and that in the probable closure of the now empty cavity the collapsing walls might lead to obliteration of the ureteral wound. It was with the same object that a drainage-tube was inserted into the cavity before closure of the abdominal wound.

The child bore the operation well, and the temperature fell steadily after it. Daily measurement was now made of the urine passed from the bladder; the quantity very rarely exceeded six ounces, specific gravity 1025, acid, without albumen or blood, and there was little variation in the amount until after the nephrectomy in November. The wound continued aseptic and dry until the 31st, when the dressings were found saturated and of a distinctly urinous odor. It is no

[1] Dr. Wright's report on the fluid submitted to him for examination: "The first sample (about a quart) contained so little uric acid that the precipitation and detection thereof led only to an uncertain result; at any rate, only minute quantities of uric acid were present. By the hypobromite test it yielded nitrogen equivalent to about 0.35 per cent. of urea, or from one-eighth to one-tenth the usual amount. This may have partly come from substances other than urea; at the most, the fluid did not contain more than about 10 per cent. of normal urine.

"The second sample contained much more uric acid, though less than a sample of ordinary healthy urine tested side by side. It yielded nitrogen equivalent to 1.35 per cent. of urea; samples of ordinary urine examined side by side giving 2.65 to 3.05 per cent. Presumably, therefore, the fluid contained half its bulk, or somewhat less, of normal urine."

wonder, therefore, that before very long there was clear indication of septicity in pus, mingled with the fluid discharge, and that the temperature again rose. Some of the fluid from the side was collected for examination, and proved to be unquestionably urine (see Dr. Wright's report); but, inasmuch as the kidney had been seen to be healthy and no orifice had been found in the ureter, it was thought advisable before proceeding to any further operation to distend the bladder and find if there was any leakage in its walls. Although the symptoms had never been those of rupture of the bladder, it seemed just possible that this might be the source of the urine flowing from the side, more especially as the quantity of water passed per urethram was so extremely small. This was accordingly done on November 6, and the bladder was found intact. No further sign of improvement was now observed; rather the child seemed to be failing day by day; there was free discharge of purulent urine from the wound, the temperature was high, 100° to 103° F., and there was much restlessness and complaint of abdominal pain. It was certain that the point of leakage showed no tendency to close, and removal of the right kidney alone remained as a means of dealing with the existing condition of things. Accordingly, on November 26, by an incision in the line of that originally made, the kidney was removed without much difficulty. The pelvis was distended and contained semi-purulent urine, while the kidney itself was enlarged to three times its natural size. Its surface was rough and granular, and here and there were visible foci of suppuration. It was, in fact, in a somewhat advanced condition of pyelonephritis. The pelvis and upper part of the ureter were both found entire. The contrast between the kidney now and the kidney when first exposed, on October 27, was most striking, and showed how rapid may be the effects induced by the combined influences of septicity and obstruction to outflow of urine.

Considering the septic state in which the operation had been undertaken, and that the wound had certainly been contaminated by the filthy stuff which was lying in the pelvis of the kidney, the immediate result of the nephrectomy was in every way satisfactory, and by December 3 the temperature was normal. The child also had rapidly begun to improve, and what is even of greater interest, the quantity of urine had begun immediately to increase, so that whereas up to the time of the removal of the kidney the amount passed from the bladder had been usually no more than from three to six ounces a day; it now rose to twelve ounces, and was afterwards rarely below, and frequently above, that quantity. Some little trouble subsequently arose from

pocketing of discharge in the cavity left after the nephrectomy, and on two occasions it was necessary to insert and pass a drainage-tube through to the loin. But when the child was discharged, on March 17, 1893, the wound had been soundly healed for some time; he was happy and well and free from pain, and passing by his single kidney a larger quantity of urine than when that kidney was sympathizing with its diseased fellow.

I have ventured to speak of this case as one of ruptured ureter, but inasmuch as the rupture was never seen, it is natural that some doubt may be felt as to the correctness of the diagnosis. It will be well, therefore, first of all to inquire if there be any evidence of ruptured ureter from post-mortem investigation. At least five cases are at our disposal for this purpose. In Vol. X of the *Transactions of the Pathological Society of London* there is that of Mr. Haviland, entitled, "Obliteration of a Ureter; Abscess-like Dilatation of the Calyces of the Kidney." We read that—

"The ureter was atrophied and impervious, and with the vessels was surrounded with a great quantity of fat. . . . Four or five years before his death he fell on his back from a height of twenty or thirty feet. . . . It is very probable that this accident caused this obliteration of the ureter, and that from this followed the disease of the kidney."

In Vol. XXIII (1872, p. 159) of the same *Transactions*, Dr. Pye-Smith records a case of "Stricture of the Ureter and Dilatation of the Kidney, apparently of Traumatic Origin."

Two years before his death, which was due to a large hydronephrotic tumor of one kidney, a man had been laid up for three days with blood in his urine, following a kick on his left side by a horse. At the necropsy the "ureter was found dilated for an inch and a half, when it suddenly became contracted, so as not to admit the smallest probe. A few lines farther on it again assumed its normal size. Here there was no calculus impacted, nor any sign of recent inflammation. Looking back at the history of the case," Dr. Pye-Smith remarks, "it appears pretty certain that the origin of the disease was traumatic. . . . And the ureter must have been injured, if not torn across, at this time." During the two years since the accident the canal had been gradually contracting, and traumatic stricture had been formed.

In Mr. Poland's well-known paper in Guy's Hospital Reports, "On Rupture of the Ureter" (Vol. XIV, 1868, p. 85), is the case of a pregnant woman who died six days after a very severe abdominal and spinal injury from having been crushed between a railway-carriage and the platform.

"The swollen parts about the right kidney were in a gelatinous condition, and smelt putrescent. . . . On examination it was found that the right ureter was torn quite across just below the pelvis of the kidney, so that it ended by a broken end in the middle of the above half-sloughing tissues."

Soller describes the case (*Lyon Médical*, 1880, T. XXXV, p. 333) of a man who nine years before his death had received a severe blow over the left renal region. The kidney was cystic and much adherent to surrounding structures, and was one-third larger than normal. The ureter presented a considerable dilatation with thinning of its tissues. This dilatation reached from its origin in the pelvis as far as the middle of its course, where it suddenly became contracted so as to admit only the head of a pin. At this level the surrounding tissues were indurated and showed chronic inflammation. All this was clearly the result of injury in which the ureter had participated.

More remarkable than any of these cases, and of greater value for our present purpose, is one recorded by the late Dr. S. Coull Mackenzie in his "Medico-Legal Experience in Calcutta,"[1] p. 98.

A cooly died twenty-four hours after having been jammed between two heavy trucks. There was no external mark of injury. "The whole of the peritoneum was highly inflamed and matted together, and was adherent to the outer coats of the small intestines by means of organized lymph. There were two small ruptures, each the size of a pea in the right ureter. The abdominal cavity contained two pints of urine mixed with blood. No bones were fractured. I expressed it as my opinion that the deceased died from peritonitis, following the extravasation of urine into the abdominal cavity through the ruptures of the right ureter."

But even without the evidence of these cases, I venture to claim for my own case that it tells the same tale. The accumu-

[1] Edinburgh: E. & S. Livingstone, 1891.

lated fluid behind the peritoneum was undoubtedly urine, which it is practically certain came neither from the bladder nor from the kidney itself or its pelvis, for each and all of these structures had been either tested or seen. The ureter alone remained as a possible source, by means of an opening in the tube.

The question of the possibility of rupture of the ureter may be considered also from an anatomical point of view. It may be said that until recent times the position of the ureter has not been thought of great moment; but since the removal of calculi lodged in it has become a recognized surgical procedure, it has become necessary to know something more definite and precise about it. If we turn to the paper of Dr. Cabot, in the *American Journal of the Medical Sciences*, for January, 1892, entitled, "Observations on the Anatomy and Surgery of the Ureter" (Vol. CIII, p. 43 *et seq.*), observations undertaken with the object of determining how best to reach the ureter in various parts of its course for the extraction of stone, we find certain facts which have a distinct bearing on the possibility of rupture. Thus he writes,—

"As the ureters approach the pelvis in the lower part of their course through the abdomen, the left ureter lies close to the spine, and in the angle between the body of the vertebra and the psoas muscle. On the right the ureter is somewhat farther separated from the spinal column by the interposition of the vena cava inferior." And further he says, "There is a relation of the ureter to the peritoneum which I cannot find mentioned in any description of its anatomy, a knowledge of which will greatly simplify this search.[1] This is the fact that the ureter is adherent to the peritoneum as it is stripped up from the parts behind. . . . The ureter was bound to the under surface of the peritoneum by fibrous bands. . . . Further, an examination of a number of subjects leads me to believe that the relation of the ureter to that part of the peritoneum which becomes adherent to the spine is within a slight range of variation pretty constant, the ureter lying just outside the line of adhesion. So that if the surgeon has stripped up the peritoneum, and come to that point where

[1] This fact, however, was noted long ago by Sir Philip Crampton, in a paper "On Aneurism of the External Iliac Artery" (Medico-Chirurgical Trans., Vol. XVI, p. 162), in which he says, "The ureter in its course to the bladder lay like a white tape across the artery, but in the process of separating the peritoneum it was raised from it with that membrane to which it remained attached."

it refuses to strip readily from the spinal column, he will find the ureter upon the stripped up peritoneum at a short distance outside of this point. On the left side the distance from the adherent point to the ureter is from one-half an inch to an inch, while on the right side it is somewhat greater, owing to the ureter being displaced to the outside by the interposition of the vena cava between it and the spine."

These investigations of Dr. Cabot rather suggest that there is a particular place where its peculiar attachments and surroundings render the ureter somewhat specially liable to injury at that place,—in fact, where, he says, it lies a short distance outside the spot where the peritoneum, to which it is firmly adherent, refuses to strip readily from the spinal column. It seems not unlikely that the lessened mobility of the ureter at this place may make it more difficult for it to escape from the effects of sudden violence applied to the abdominal wall. Fixed parts of the intestinal tube are more liable than freely movable parts to be ruptured or contused from external violence, and doubtless the same thing holds good of the ureter also. Tending in the same direction are the remarks of M. Tuffier in his paper in the *Archives Générales de Médecine*, 1889, Vol. XX, p. 356, on "Ruptures of the Kidney and Ureter." Of these latter he says that accidental ruptures occur very much in the same way as ruptures of the kidney.

"Le conduit," he writes, "se rompt au niveau de son attache au bassinet. J'admettrais volontiers qu'il vient s'écraser sur l'apophyse transverse de la première lombaire saillante à ce niveau, absolument par le même mécanisme que celui qui déchirait le rein dans les contusions. Toutefois quand j'ai essayé d'arracher l'uretère sur le cadavre, c'est à ce niveau que je l'ai vu se rompre. On pourrait donc penser que l'arrachement peut être la cause de cette rupture. Quoi qu'il en soit, cette rupture est généralement totale et s'accompagne de rétraction des deux bouts du conduit."

Whether, then, the ureter gives way by reason of lessened mobility, or because it is actually crushed between the external force and the spinal column, there seems to be no question that rupture at some point in its course, remote from its origin in

the pelvis of the kidney or its termination in the bladder, may ensue from violence applied to the abdominal wall.

We may, therefore, turn to a consideration of the indications of the injury and the various means of treatment at the disposal of the surgeon.

Taking them in the order of their publication, there are, exclusive of those which were both fatal, four cases besides my own from which conclusions may be drawn,—the case of Stanley, as far as I know the earliest on record, the case of Barker, the case of Godlee, and the case of Allingham. All of them confirm the remark of Stanley, who, contrasting rupture of the bladder with rupture of the ureter or pelvis of the kidney, wrote that[1] "the rupture of the ureter or pelvis of the kidney may present this remarkable feature when contrasted with the consequences of a rupture of the bladder; that whilst in cases of the latter injury symptoms immediately arise directly pointing to the organ which has suffered, in cases of the former kind (the lesion of the ureter or pelvis of the kidney), no symptoms may immediately occur leading to a suspicion of injury to any part of the urinary apparatus." This fact will be best made obvious by a brief epitome of the main features of these four cases.

Mr. Stanley's was that of a boy, aged nine, who had received severe contusions of the lower part of the abdomen, followed by great pain, ecchymosis in the integuments around the pelvis, and extensive suppuration in the subcutaneous cellular tissue, from which several ounces of matter were discharged by puncture near the left sacro-iliac symphysis. There were all the general indications of a serious abdominal injury, but it was not until the lapse of six weeks that a swelling was observed on the right side of the belly, oblong in shape, reaching from the base of the chest to within a short distance of Poupart's ligament inward as far as the linea alba, and posteriorly into the lumbar region. Examination of the fluid withdrawn by puncture showed that it was accumulated urine.

Mr. Barker's[2] patient was a child, three years and eight months old, which had been run over by a hansom and bruised on the right side of the abdomen. There was, however, no sign of any very

[1] Medico-Chir. Trans., Vol. XXVII, p, 11, 1844.

[2] Lancet, 1885, Vol. I, p. 95.

serious injury, and after having been in the hospital for fifteen days it was discharged. After four days it was brought back, and then for the first time a fluctuant swelling was seen to fill the right side of the abdomen. Aspiration proved that the swelling was due to a collection of urine.

Mr. Godlee's[1] case was that of a girl, aged four, who had been run over by a cab the day before admission to the hospital. There were pain and tenderness with considerable bruising in the left inguinal and lumbar regions. These gradually diminished in the course of a fortnight, and there then appeared a certain amount of tension in the part where the bruise had been. "The indefinite swelling gradually gave place to a large, well-defined, elastic, and fluctuating tumor," which occupied very much the same position as that in Stanley's case, and which was aspirated twenty-three days after the receipt of the injury. "Five hundred and fifty cubic centimetres of turbid, slightly alkaline urine, containing 0.3 per cent. of urea," were evacuated.

In Mr. Allingham's[2] case, that of a lad sixteen years of age, the symptoms of abdominal injury from a severe blow were altogether more urgent from the first, and it was as early as the sixth day that he was called upon to explore a swelling which had formed on the left side of the abdomen.

In my own case, as the history has shown, it was not until all suspicion of any internal injury had faded that the abdominal indications of the lesion began to appear.

Why is it, it may be asked, that the collection of fluid behind the peritoneum after rupture of the ureter should be so long in being formed? Several explanations occur. If the rupture has been complete and the ends have curled up, as described by Tuffier, there must for a time, of course, be an obstacle to the escape of urine. Such obstacle may perchance lead to an actual diminution in the quantity of urine excreted, and a longer time elapses before such an amount has accumulated above the seat of rupture as to overcome the obstruction, and the urine begins to collect outside the tube. On the other hand, if the rupture has been partial and situated at one side of the tube, as in Coull Mackenzie's fatal case, some portion only of the urine may leak, while the remainder finds its natural route to the bladder. More-

[1] Clinical Society Transactions, Vol. XX, p. 219.

[2] British Medical Journal, Vol. I, 1891, p. 699.

over, in the case of injury to intestine, we know that perforation may be due to secondary sloughing rather than to primary rupture; and the slowness of the collection of urine behind the peritoneum may in like manner be due to the orifice having been formed by the sloughing of a severe bruise, rather than by immediate rupture at the time of the accident.

While then the one distinctive indication of what has happened seems in the ordinary rule to be postponed for some days or weeks, the surgeon has very little in the mean time to help him to a diagnosis directly after the injury. There may be the common indications of some abdominal injury, such as tenderness, pain, vomiting, and collapse, all of which may soon subside, and not one of which is of any special diagnostic import, but any blood there may chance to be in the urine may be so small in quantity as to be counted as of no moment, to be disbelieved, or entirely unobserved. Yet blood in the urine is a pretty certain indication of injury somewhere or other in the urinary organs, and a history of its presence, more especially if the amount has been small, ought to raise the suspicion of rupture of ureter after abdominal contusion. In injury to the kidney or the bladder the quantity is usually large and intermingled with the urine; while, as my own case has shown, after rupture of the ureter there may be no more than one or two minute clots. In Barker's case there were two or three small clots, but in Allingham's the urine was throughout free from blood, and we are told that in Godlee's case nothing had ever been noted amiss with the urine. An exception to this apparent rule, if indeed it was really one of ruptured ureter, is in the case of "Hydronephrosis of Traumatic Origin,"[1] recorded by Hicks. That case seems to me to have been almost certainly one of rupture of the ureter from a severe kick by a horse on the lower part of the abdomen of a boy aged twelve, and it is stated that the next day there was much blood from the bladder. However that may have been, the size of the ureter renders it unlikely that there can be any considerable quantity of blood, and when, as in Hicks's case, we read of much having been passed, the presumption is that the pelvis of the kidney may have been damaged at the same time. It comes,

[1] Medical Record, 1880, p. 424.

therefore, to this, that soon after the injury there may be a small amount of blood in the urine, and that signs of the collection of urine behind the peritoneum may not show themselves for several days. Diagnosis could hardly, therefore, be more difficult or uncertain, and the surgeon may have no more than a suspicion of what has occurred. The character of the urine may, however, be some help to him. In one or other of various ways it is probable that the site of injury to the ureter is also the site of some obstruction to the passage of urine along it. The effect must soon be felt by the kidney, which has thus to work against pressure, and apart from the fact that some of the urine excreted by it never reaches the bladder, the daily quantity is in all probability below the average. Great also is the reduction in the amount of urea, whether we examine the fluid withdrawn from the cyst or in that which is collected from an opening in the loin. This was strikingly exemplified in all three cases of Godlee, Barker, and my own. The record of Mr. Barker's case is indeed especially valuable for the prolonged series of observations on the urine, observations which revealed a vast difference in the percentage of urea in the urine from the two kidneys. Furthermore, the persistent irritation of the kidney on the affected side may tell upon the kidney on the sound side, so that it also excretes less urine than is normal. Look at the history of my own case for an example.

Let us now consider the various methods at the disposal of the surgeon for dealing with this serious injury.

First of all, and to be commended for its simplicity, but for its simplicity alone, is that of simple puncture for the evacuation of the fluid, as was originally done by Stanley.

He tells us that at the end of the sixth week, supposing the swelling to be an abscess,[1] he made a puncture with a lancet so that a little clear yellow fluid escaped, and that three weeks afterwards, the abdominal swelling having again become tense, he let out with a trocar, inserted midway between the last rib and the crest of the ileum, fifty-one ounces of the same kind of fluid as before. On four successive occasions, at intervals of eleven days, sixteen days, three months, and

[1] Here it is interesting to note that in none of the cases did suppuration occur until after the admission of air to the cavity.

six weeks it was needful, by reason of reaccumulation of the fluid, to use the trocar, and then after the last evacuation we read, "From this period the swelling continued without increase or obvious diminution; it still extended from the linea alba into the right lumbar region, and as any further interference by operation or otherwise was now considered inexpedient, I discharged the boy from the hospital nine months after the occurrence of the accident. At several subsequent periods I have seen him in good health, with the abdominal swelling still distinct, but, as we have thought, slowly diminishing and with less evident fluctuation."

It would have been of much interest to know what ultimately became of this boy, and whether there was subsequent disease or atrophy of the kidney. It is enough, however, for our present purpose to recognize that simple puncture by trocar and evacuation of the cyst may be insufficient as a means of cure. Nor is the method likely to be adopted in these days of abdominal exploration, and aversion from plunging trocars into abdominal cavities. Hicks, however, met with more success, for after three aspirations the quantity of urine from the bladder increased, and the boy got gradually well.

More adequate drainage of the cyst-cavity is obviously necessary. This it was that I endeavored to obtain in my own case, and was obtained with such signal success by Mr. Allingham in his. Having made an incision in the left linea semilunaris he opened the peritoneum and saw, on lifting the descending colon, a large sausage-shaped tumor, covered with peritoneum, extending from the kidney right down to the pelvis, exactly in the course of the ureter. It was very tense and the pelvis of the kidney was not distended. Suspecting what the swelling was, he proceeded, with most excellent judgment, to open the tumor by puncture from the loin and let out more than a pint of turbid urine. He found the cavity smooth and thought he felt the calyces of the kidney, while downward it went beyond the reach of the finger towards the bladder. The front wound healed at once, and the drainage-tube was removed from the loin on the sixth day, and in less than a month the boy was sent out well. On the assumption that this case of Mr. Allingham's was one of ruptured ureter,—and I do not think there can be much doubt

about it,—one must believe that in the free drainage and by gradual contraction of the cavity, the orifice in the ureter was sealed. It is of extreme interest to note that in his case, as in my own, the quantity of urine increased immediately after the operation and rose from fourteen ounces to twenty-eight, forty-four and fifty-four when measured at intervals in the course of the next ten days; not alone, I should imagine, because the urine from the kidney on the side of the rupture was now able to get into the bladder, but partly from this cause and partly from an actual increase in the quantity excreted by both the glands. The good result in Mr. Allingham's plan of treatment may, of course, have been in great measure due to the hole in the ureter having been very small, and in this hope it would be well to try his plan in future cases, although there could not be much promise of success when the ureter had been torn completely across, and the ends had retracted in the manner already described. Drainage behind must be more efficacious than drainage in front, and had my case been drained from the loin it is possible that the kidney might have been saved.

Failure of either of these methods of treatment leaves nephrectomy as a last resource, unless the surgeon should prefer to abstain from further treatment in the hope that the collection of fluid may come to an end, and the patient recover from the injury. I doubt very much whether in such circumstances there can be a real cure, for the probability is that, even though septicity be avoided, the kidney will become atrophied. Thus in the case brought before the Clinical Society[1] by Mr. Croft, in which he believed that obstruction of the excretory tube by adhesive inflammation rather than disturbance of the excretory *organ*, was the cause of the repeated collection of urine in the loin after an injury to the pelvis of the kidney, he says, "I imagine that the cure has come about by the atrophy of the left kidney, and the obliteration of the cavity." Such also, in all probability, was the end of Stanley's case, but it cannot, of course, be regarded as "cure" in any proper sense of the term.

There always remains the risk of the cavity becoming septic, when the condition of things is completely changed. The three

[1] Vol. XIV, p. 107.

cases, Godlee's, Barker's, and my own, all tell the same tale. Thus of Mr. Godlee's case we read that the tumor having rapidly refilled after aspiration, he proceeded a month after the accident to lay the cyst open and insert a drainage-tube. "For three weeks the patient was quite comfortable, except for the copious leakage of urine from the wound, which showed no sign of diminution; the tube had been removed and the cavity and the sinus had both very much contracted. Then began the first of a series of pyrexial attacks, no doubt due to some accumulation of pus and urine in the deeper parts of the wound. . . . In these the temperature often rose to 103° or 104° F., and the child was becoming pale, thin, and pasty-looking. The reinsertion of a tube had no effect in stopping these attacks. . . . I accordingly thought it best to remove the kidney through a crucial incision in the loin." The operation was extremely difficult, for the organ was embedded in dense fibrous tissue, and he feared that the upper end of the ureter was left behind and was the cause of the non-closure of the sinus, which continued to discharge a little pus. The history of my own case has shown very much the same course of events, while a most perfect demonstration was given to us of the combined effects of septicity and obstruction upon the kidney. When first seen it was in every respect healthy; when seen at the time of the nephrectomy it was enlarged and inflamed, and pus in it here and there, and its pelvis had practically become an abscess cavity.

So, also, Mr. Barker found it necessary to remove the kidney a month after free drainage had been established, and rather more than three months after the receipt of the injury.

In all these cases of nephrectomy the operation was borne well, and the remaining healthy kidney rapidly took up the work of both, and as my own case showed, the quantity of urine forthwith increased. Herein, indeed, lies the necessity of removing the diseased and pus-inoculated kidney on the affected side, that when it has become inflamed by reason of septic extension from the seat of the exploratory wound there is a grave risk that the kidney on the uninjured side may presently share in the morbid process. In his masterly paper, "On Disturbances of Sensation with especial Reference to the Pain of Visceral Disease" (*Brain*,

Vol. LXI), Dr. Head points out that so long as the organism is perfectly healthy disturbances in the activity of an organ produce pain and tenderness over certain definite areas only; but that when the pain has remained localized for a considerable time, the condition of the central nervous system becomes profoundly altered. And he proceeds, "When one testicle is affected, the tenderness also tends to be bilateral, and the same applies to the kidneys, especially if the disease is a long and wearing one. Thus there is a great tendency for both pain and tenderness to spread to the opposite side at the same spinal level." Here we have an explanation of the long-known fact that serious disturbance in the secretory gland of one side may profoundly affect that on the other, even to complete suppression of urine. The sooner, therefore, that nephrectomy is performed in these conditions of septic disturbance after rupture of the ureter the better is the prospect of success from the operation itself, and better also that of the patient's future health, dependent as it must more than ever be on healthy renal function.

It ought not to be regarded as a thing of light moment to sacrifice a kidney, and the surgeon should therefore give a fair trial to aspiration of the cavity or to free drainage, keeping the parts aseptic if he can.

The question of treatment, however, cannot be closed without a consideration of the possibility of suture of the ureter and the prevention thereby of all the troubles which these various cases suffered. It occurred to me at the time when I first laid the cyst open, but in the portion of it visible the ureter was intact, and as it coursed away from the region of the kidney it became altogether lost to view, and I did not deem it advisable to follow it. Cabot remarks in his paper that it is "extremely hard to find the lax tube." And if hard on the cadaver, it must be infinitely harder on the living subject. The ureter, as we know, has from time to time been sutured with success, in some cases to close the lateral incision made into it for the dislodgement of calculus, in others because of injury or division in the course of uterine operations. It is one thing, however, to find and expose the ureter in these conditions, and quite another thing when there is no fixed calculus to mark its position, or it has not been

brought into view. Nevertheless, the success which has attended ureteral suture, not only in the simple process of closing an incision made for the extraction of a calculus, as in the case reported by Arbuthnot Lane,[1] but also in the more complicated anastomosis, after the manner of Van Hook, related by Dr. Howard A. Kelly in the January number of this journal, shows that it might be well for the surgeon to try and restore the continuity of the tube, should, haply, the degree of injury it has sustained admit of this procedure.

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STRANGULATION OF TESTICLE FROM TWIST OF THE SPERMATIC CORD.[1]

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THAT so rare a lesion should not have been observed before 1885 is surprising. I say rare lesion advisedly, because up to the present I have been able to collect only fourteen cases where strangulation of the testicle was dependent on torsion of the cord, though all know that gangrene of the testicle may follow orchitis, neglected strangulated hernia, epididymitis from gonorrhœa, and Gerster mentions two cases of spontaneous gangrene not associated with the peculiar twist of the cord.

Again, to explain the surprise at no one having observed so rare a lesion earlier, we must remember that, being a macroscopic trouble, it was capable of observation by the ancients prior to the introduction of the finer methods of instrumental diagnosis, yet we find no record of the Fathers bearing on the subject. The method of producing sterility in men and animals by twisting the cord intentionally was, however, not unknown nor unpractised.

To have collected fourteen cases from less than ten years means that many a case must have been overlooked before gangrene was considered a possibility, or put down to irreducible hernia, and more or less risk run from neglect.

No modern surgery that I am familiar with mentions it, except Ashhurst's last edition, quoting my case with three or four others. Morrow's "System of Genito-Urinary Diseases"

[1] Read before the Clinical Society of Maryland, February 16, 1894.

does not consider it, nor does Moullin, though I believe a late work by Jacobson, "Diseases of Male Organs of Generation," mentions it. The best *résumé* of the cases is found appended to a report of Case No. 13 from table by Mr. Edmund Owen[1], to which I am largely indebted for the details of this paper.

That the accident is not confined to the human species, I would call attention to a paper by Mr. J. Bland Sutton,[2] reporting a case of torsion of the spermatic cord in a dog with consequent necrosis of the testicle. In this case the rotation was caused by a growth. He concludes by saying, "We have now evidence that nearly every viscus in the belly is liable to rotate axially and twist its pedicle,—*e.g.*, testicles, kidneys, spleen, ovaries, and the gravid uterus. Tumors, such as ovarian cysts, dilated tubes, myomata, omental hydatids, and the like, are also liable to rotation."

Causes.—From the number of times that non-descent of the testicle has been associated with gangrene, eight out of ten in the table, we find ground for belief that this is another danger which besets the misplaced gland in addition to the increased liability to sterility, malignancy, and atrophy over its normally-placed mate.

The occasional hernia in the same locality augments the risk by the presence of a foreign body in the scrotum, but more decidedly by the taxis undertaken by the patient or his attendant twisting the cord.

Strain, though occurring in every man, woman, and child every day, has been put down as a cause. In my own case blowing hard on a cornet was assigned as the cause; but I am disposed to think that strains are overestimated as causes, something like the old *fons et origo* of hip-joint disease, a fall, which children get so frequently without bad results. The twist of the cord has occurred in boys lying in bed and without the history of exertion, so strain is not the only cause at any rate.

"The theory of the misdirected energy of the gubernaculum is not altogether acceptable, for even if the gubernaculum has all the power

[1] Brit. Med. Journal, November 18, 1893, p. 1247.

[2] Med. Chir. Trans., London, loc. cit., p. 259.

ascribed to it, it is difficult to see how, being fixed at the lower end, it can swing the testis round and round." At best muscular fibres are only occasionally found in the gubernaculum; it exerts no traction; is a fibrous cord only acting as a guide.[1]

I am not so sure that the spasmodic action of the cremaster in some cases is so innocent of the malposition as the gubernaculum, when, as Agnew puts it, the testicle becomes the sport of the cremaster and gubernaculum.

The lower fibres of the internal oblique muscle usually appear very thin and of a pale color as they arise from the upper surface of the inner border of Poupart's ligament externally to the spermatic cord, across which they curve downward, and, becoming tendinous, blend with the tendon of the transversalis muscle at the crest of the pubes. The spermatic cord usually receives an investment of fascia from the contiguous border of the internal oblique muscle, consisting of loops of loose cellular tissue and muscle-fibres called the cremaster. The muscular covering is usually more pronounced at the outer part of the cord, and is always more easily distinguished than the other coverings. In some bodies it is difficult to trace any connection between the cremaster, even when well developed, and the lower border of the internal oblique, the former appearing to be festooned across from Poupart's ligament externally to the cord to the pectineal line of the pubes. In several cases of undescended testicle some looped fibres corresponding to the cremaster have been found in the scrotum.[2]

That the movement of the testicle in the scrotum is due partly to the cremaster can hardly be doubted, and when we have more force exerted on one side from the greater development of the muscle on one side, it is not hard to imagine a twist from the same source, though I am bound in fairness to say that the twists found are not confined to one direction.

Van Buren and Keys mention a case of acquired monorchidism when the right testicle was suddenly and violently drawn up into the inguinal canal during masturbation and did not come down again.

[1] McClellan's Regional Anatomy, Vol. II, p. 89.

[2] McClellan's Regional Anatomy, loc. cit., pp. 85 and 86.

Later in life, when the patient died, the testicle was found soft, atrophied, pulpy, and about one-fifth the size of its fellow.[1]

Whatever the cause or causes may be, and they are more or less in the domain of speculation at present, the pathology is not quite so indefinite. The twist in the cord is either so marked that both arterial and venous stasis is produced or the vein, being less resilient than the arteries, has the brunt of the pressure, and circulation ceases with resulting necrosis unless relief is at hand, as in Case No. 7, when Mr. Nash unwound the cord without operation and restored the circulation thereby.

I have, through the kindness of Dr. W. W. Keen, of Philadelphia, a microscopic report of his Case No. 3, in which Dr. Bevan says,—

"Upon puncturing the testicle posteriorly with a sterilized needle, it was observed that the parenchyma was exceedingly soft and granular, having been broken down and destroyed either directly by the microbes or indirectly through interference with its blood-supply. There were also large clots in the veins. The connective tissue had not as yet succumbed to the pathologic process and contained in its meshes the degenerated cells referred to. Upon withdrawing the needle there oozed out a little thin and blackish fluid. Cover-glass impressions were made and tubes inoculated. The cover-glass films were treated with acetic acid and stained by a rapid method with methyl violet. Examining these slides with a microscope I found innumerable cocci and bacilli to be present. The thrombi in the veins were infected as proved by stains made from the removed coagula. Although attempts were made to secure cultures from the infected organ, no growths could be obtained; presumably the antiseptic used in the operation had destroyed their vitality. In sections of the organs no germs were present in the parenchyma, but the clots in the vessels of the epididymis contained innumerable bacteria."[2] Speaking of the infection that occurs in hernia, Dr. Bevan goes on to say, "Most important among these was a small bacillus and a coccus resembling, though not identical with, some of the cocci of suppuration.

"The two organisms had been isolated from gangrenous intestines,

[1] Genito-urinary Diseases, p. 392.

[2] Phila. Med. News, April 30, 1892.

the result of strangulation in the human subject. They had also been demonstrated as being the saprophytes of the intestines, and only springing into action when the intestine was subject to unfavorable conditions affecting materially the circulation or obstructing the flow of the contents.

"The method by which infection occurred was presumed to be as follows: When the lumen of the intestine had become occluded, permitting the production of ptomaines in large amount, this led to inflammation which afforded a suitable nidus for infiltration of saprophytes.

"The bacillus seemed more active than the coccus, and could be found not only in the gangrenous bowel, but in the fluid contained in the hernial sac. The cocci were found only in the walls of the sloughing tissue.

"With these experiments borne distinctly in mind, we are able to arrive at a more definite idea of the method by which infection at this place in the testicle occurred. There had been a hernia which evidently had not become gangrenous itself, but, on account of the strangulation to which it had been subjected, the micro-organisms had penetrated its walls and thus infected the vessels of the epididymis. The bacilli are supposed to be active in the production of gas, and some observers ascribe to the cocci the power of engendering gangrene."[1]

Bearing on this source of infection, for there is more or less mystery how infection begins in closed cavities, let me quote a recent article by G. R. Fowler,[2] who says,—

"Evidence is constantly accumulating which shows that the common bacillus of the colon is not always an innocent micro-organism. It may pass the barrier of the intestinal mucosa (although under proper conditions it may also set up an active desquamative process here) and penetrate into the general circulation, producing disturbances in a wide variety of organs and virulent toxic effects upon the system at large. It has been found by Wyss in a case of enlarged spleen; by Larulle, Roux, Rodet, and A. Fränkel in suppurative peritonitis; by Tavel in a hæmatoma following thyroidectomy; by Gilbert, Girode, Naunyn, and others in diseases of the biliary passages;

[1] Loc. cit.

[2] Observations upon Appendicitis, ANNALS OF SURGERY. January, 1894, p. 29.

Rodet, Viellon, Jayle, Stern, and A. Fränkel found it in abscess of the liver; Levy demonstrated its presence in lymphangitis of the arm, and Chiari found it in a case of septic emphysema in a diabetic patient. Stern discovered it in a case of general pyæmic infection with suppurative meningitis. Lasage and Maxime Macaigne have found it in the stage of reaction of cholera. Its existence has been shown in cholera infantum, dysentery, broncho-pneumonia, endocarditis, meningitis, nephritis, and cystitis, by the labors of Henkemaus; Welch noted its existence in case of peritonitis consecutive to an intestinal lesion without perforation. The latter observer believes that the micro-organism does not necessarily possess, nor assume, pathogenic characteristics so long as it is brought in contact only with sound mucosa, but that following almost any lesion of the intestine it becomes migratory. My own experience accords with the observations of Viellon and Jayle, that Escherich's bacterium commune coli can produce not only inflammatory lesions but suppuration as well."

Symptoms.—These simulate strangulated hernia to a very marked degree, except that the constitutional disturbances are not so decided. Nausea, vomiting, some rise of temperature, some swelling, chill perhaps, but less acute inflammatory symptoms, crepitus of gas after mortification has set in, etc., but bear in mind the *mildness* of systemic evidences compared with the pronounced shock of strangulated hernia which exists so often even after the pain has subsided and the gut is dead. A much more important organ, the intestine, is at stake here and pleads its cause more openly than the testicle. I doubt, however, if many whose attention had not been called to this peculiar lesion, either by a previous case of their own, as was Mr. Nash's experience in Case No. 7, or late reading, would diagnose it from strangulated hernia, but now that it is a recognized possibility, it should enter into the make-up of diagnosis by elimination in this region. The following are a few points tabulated that may aid in a differential diagnosis:

No.	Strangulated Testicle.	Strangulated Hernia.	Bubo.
1	Moderate shock.	Marked shock.	No shock.
2	Possible strain.	Probable strain.	History of sore or venereal
3	Undescended testicle often.	Normal testicle.	Normal testicle. disease.
4	External abdominal ring empty.	Occupied.	Ring empty.
5	Cord twisted but not obscured.	Cord obscured.	Cord normal.

Exploratory incision is the crucial test, however, and, now that we explore all cavities with comparative impunity, it may be interesting to speculate in cases of doubt, but we have in the incision the means of making an end of uncertainty.

In appearance the testicle is not unlike the dark gangrenous gut, but the comparative weight of the two clear up that delusion. It has been appropriately likened to a ripe plum.

Prognosis.—After removal all cases have recovered. In one or two cases the kink has been untwisted after the incision, but further reports state that the testicle has sloughed away as it was too far sphacelated to recover. I do not think the testicle has the same chance for recuperation as a similarly compressed gut, as the veins are so unsupported, as we see in varicocele, that the congestion is harder to reduce per *vias naturales*. In one case, as above stated, the kink was untwisted without operation with immediate recovery, but the prognosis is largely modified by the length of time the twist has lasted.

Treatment.—The exploratory incision is the best treatment, as it clears up the diagnosis, and we can then untwist or remove the testicle as our judgment sees fit.

Taxis will only do harm, and untwisting a doubtful case might be more serious than operation if the case prove to be a hernia, and as herniæ are a thousand to one strangulated testicle, we should be very sure of our diagnosis before we set to work to twist or untwist the cord. Of course, drainage is very essential after the removal of a gangrenous testicle. The question of operating for the permanent cure of the often accompanying hernia is best left to the judgment of the operator in individual cases.

TABLE OF CASES OF STRANGULATED TESTICLE.

No.	Operator.	Age.	Side.	Hernia.	Cause.	Descent.	Twist.	Treatment.	Reporter.
1	Whipple, Nash.	16	Left.	None.	Strain.	Undescended.	Two twists.	Removal.	Brit. Med. Journ., January 6, 1891.
2	Thos. Bryant.	15	"	"	No cause assigned.	"	Three half twists out.	Untwisted, atrophy.	(Royal) Med. Chir. Trans., Vol. LXXV, p. 247.
3	W. W. Keen.	23	Right.	Yes.	Strain.	"	Three half twists.	Removal.	Lancet, V. 1, 1892, p. 472.
4	Davies-Colley.	14	"	None.	None.	"	Three half twists to right.	Untwisted, slough.	Brit. Med. Journ., April 6, 1892, p. 811.
5	H. Page.	17	"	Yes.	"	Descended.	Twist to right.	Removal.	Lancet, July 30, 1892.
6	Langton.	. .	Left.	None.	"	"	Twist.	Slough.	St. Barthol. Hosp. Reports, Vol. XVII, p. 88.
7	Nash.	19	Right.	"	"	"	Half turn to left.	Untwisted without operation.	Brit. Med. Journ., April 3, 1893.
8	Barker.	15	"	Yes.	"	Undescended.	Three half turns to right.	Removal.	Lancet, April 8, 1893.
9	F. Cohen.	20	"	None.	"	"	Twice in.	"	Deutsche Zeitschr. f. Chir., 1890, p. 101.
10	Gervais.	4	. . .	. . .	. . . .	. . . . .	. . . . .	Recovery.	Med. Press, May 11, 1892.
11	Nicoladoni.	16	Right.	None.	None.	Undescended.	Outward.	Removal.	Langenbeck's Arch., 1885, p. 180.
12	Nicoladoni.	62	"	. . .	. . . .	. . . . .	One turn.	"	Langenbeck's Arch., 1890, p. 163.
13	Owen.	13	Left.	None.	None.	Undescended.	Half turn.	"	Lancet, November 18, 1893, p. 1247.
14	R. W. Johnson.	20	"	Yes.	Strain.	Descended.	Three half twists to left.	"	Annals of Surgery, March, 1893.

In conclusion, I append an abstract of the case reported by me in ANNALS OF SURGERY, March, 1893:

G. R., aged twenty years, white, single, upholsterer, had inguinal hernia in left side. While blowing cornet, October 9, felt it (gut) descend. Had some symptoms of strangulated hernia, vomiting, pain over tumor. Seen in consultation with Dr. Clewell, October 11. Condition fair; no marked symptoms of strangulated hernia except irreducible, slightly painful tumor in scrotum. The next day a suspicious crackling on pressure in the vicinity of the tumor induced me to cut down over it after reducing a part under anæsthesia. Found sac thickened, but containing no gut or omentum, but below it lay the testicle, gangrenous and emphysematous from a series of twists of the cord, which had cut off the circulation. Removed testicle and sac after tying it near external ring. Closed wound as usual, allowing capillary oozing to form clot, and inserted a sliver of gauze in the lower extremity of the wound in case drainage was necessary. It was removed in forty-eight hours, and the incision healed without further trouble.

CONTRIBUTION TO THE STUDY OF HEAD INJURIES, AND OF THE RESULTS OF TREPHINING FOR SUBDURAL HÆMORRHAGE, ABSCESS OF BRAIN, AND EPILEPSY.[1]

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DURING the last two years I have had the occasion to trephine twenty-seven times. Of these the majority, fifteen in all, were made on account of fractures of the skull. They represent all forms of lesions, from compound and comminuted fractures extending into the base, with laceration of membranes and brain, to simple depressed fractures of the vertex. Four of these cases died, all of which had extensive fractures of the base of the skull.

Five cases were operated upon on account of traumatic epilepsy, four of which were greatly improved, although a cure was probably not obtained in any case. Five cases were operated upon by linear craniectomy for microcephalus with idiocy without any apparent improvement in any case. One case was trephined for subdural hæmorrhage with aphasia and hemiplegia and recovered perfectly, and one case recovered after trephining from a brain-abscess. All operations were performed with the usual precautions in the Sisters' Hospital, and all recovered, with the exception of four with necessarily fatal injuries of the base of skull. In regard to covering the bony defect after trephining, I have tried to implant a layer of leaf-gold unsuccessfully several times. Granulations occurred on both sides of the gold, forming a semi-fluctuating painful swelling, which necessitated its removal. I

[1] Read before the New York State Medical Society in Albany, February 7, 1894.

have twice successfully implanted a celluloid plate covering the defect and inserted beneath the internal table.

In one case I reimplanted successfully the whole bony disk removed by a very large (one-and-a-quarter inch) trephine. This is, of course, the ideal proceeding. In several operations for traumatic epilepsy I covered the dura, mosaic fashion, with bits of the bone removed without paying any particular attention to whether the internal table of the bits of bone turned inward or not. I thereafter closed the wound without drainage. All the cases, with the exception of one, in which suppuration occurred and the bone particles had to be removed, recovered without complication, and adhesion between the dura and the scalp was most successfully prevented. Where laceration of the dura and brain was present, this method, of course, cannot be used, and in such cases I always pack the wound loosely with iodoform gauze, and expect healing by granulation.

Three of the cases deserve special mention.

CASE I.—*Trephining for Subdural Hæmorrhage with Aphasia and Right-sided Paresis; Recovery.*—D. B., twenty-five years of age, entered the Sisters' Hospital on November 13, 1893, with the following history: Twelve days previously, while in a fight, he was struck by his opponent's fist on the right side of his head and knocked down, striking the left side of his head on the plank side-walk. He was able to walk home, but his face and eyes were swollen, and he complained of severe pain in the back of the head. Nothing further could be learned about his condition, while at home, except that he, on the day of admission to the hospital, had had a fit with convulsive movements of right side of face and arm. While being prepared for bed he had another fit with similar muscular contractions in face and arm.

On examination paresis was seen of the right side of the face; there was constant twitching of muscles of right hand and arm; tongue drawn towards the left side; left pupil contracted. He experienced some sensation in arm and leg, but apparently none in the face. There was some paresis present of right arm and leg, which he moved with difficulty. Complete aphasia present. He could neither articulate nor did he appear to understand what was said to him. Temperature normal; pulse 96.

℞ Ice to the head.
Iodide of potash, gr. x.
Fl. ext. ergot, min. xx.
Every four hours.

On the following day, November 14, he appeared somewhat better, could raise arm and leg at will, although with difficulty, and seemed to understand questions and to make an attempt to answer, but he was unable to utter a sound. He was restless and sleepless. Pulse 120. After consultation with Dr. Crego, the neurologist to the hospital, who concurred in the diagnosis of a clot on the brain, either extra- or intradural, over the centre of speech, extending upward and involving the motor area on the left side, operation was decided upon, and performed on the following day, November 16, after the usual antiseptic precautions had been taken. A curved incision, convex downward, was made from the external lower border of the frontal bone downward and then upward, terminating just above the ear. The large wing of the sphenoid and the temporal bone was exposed, and by aid of a large trephine, one-and-a-quarter inch in diameter, a button of bone removed over the base of the third frontal convolution, involving the centre of speech and face. No external bleeding was found. The dura was bluish in color and bulged forward, showing great pressure behind. No pulsation was seen. A small puncture was made through the dura, through which a fine stream of old blackish blood squirted several feet in the air. The dura was therefore freely opened, and a large amount of similar blood, estimated at three ounces, evacuated. A large blood-clot now appeared, covering an area of about three square inches and being about one-quarter inch thick. It extended upward and backward, was firmly adherent, and removed with difficulty, partly by aid of forceps, partly by a sharp spoon. Pulsation of the brain was thereafter plainly seen. The brain seemed excavated and pressed inward, where the clot had been removed. The wound was thereafter thoroughly irrigated with warm sterilized water; the dura sutured with fine catgut, the button replaced, the wound closed without drainage, and antiseptic dressings applied.

The further course was very favorable. The wound healed by first intention. Two days after he could say yes and no and count to four, and two days later the aphasia had disappeared, the patient being able to talk freely, although pronouncing some words with hesitation and difficulty. The paresis of arm and leg disappeared com-

pletely in a week, and the patient got up. On his discharge, four weeks later, it was noted that vocal fremitus over left side of head was normal, the pupils normal in size and reaction. Paralysis of the face had entirely disappeared, and the condition of the facial nerve was normal. He was able to draw the face to either side and raise the nostrils. Tongue could be protruded without deviation to either side. His right hand was somewhat weaker, registering 70 to left 90. Knee reflexes normal, muscular power and sensibility perfect. Aphasia had completely disappeared, memory was perfect, and he left the hospital mentally and physically completely restored.

His assailant was discharged from jail a wiser and, I hope, a more peaceable man a week after the operation.

This case is of interest on account of the correct diagnosis, verified by prompt operation, the replacement and successful implantation of the large button, by which adhesions of dura to the skin and possible future troubles were avoided, the rapid disappearance of all the serious symptoms, and the complete restoration of the patient to health and of his assailant to liberty.

I wish here to call attention to the dangers of using strong antiseptics in operations on the brain. Physiological investigations have shown[1] that the brain is extremely sensitive to chemical irritants, and it was found that carbolic acid in strength above 1 : 200 speedily produced death, and that corrosive sublimate, even as weak as 1 : 10,000, inflicted severe injury upon the brain-tissue. I believe that nothing but sterilized water ought to be used in brain injuries or operations.

CASE II.—*Trephining for Abscess of Brain; Recovery.*—G. B., four years of age, entered the Sisters' Hospital on November 22, 1893. Eight weeks previously he had been injured on the top of his head by a "rasp," which some other boys were throwing up in the air. The injury consisted of a punctured wound of scalp and skull. No physician was called; the wound was bandaged at home, and the little boy continued playing. The next day head was swollen, and the boy remained in bed all day; but thereafter he apparently got well, and continued healthy for six weeks. Two weeks before admission he began to get easily fatigued, looked pale, had slight fever at night, attack of vomiting, and increasing drowsiness and stupor. One

[1] Deutsche Medicinische Wochenschrift.

week later the family physician was called, found the boy with a fever of 103° F., rapid pulse, mental dulness, and stupor. He advised his removal to the hospital, but the parents first consented one week later, as he rapidly was growing worse, and the stupor was increasing. On examination he looked pale, with heavily-coated tongue, slight facial paralysis on left side, otherwise no symptoms of paresis. He was in a state of stupor, fretful, and peevish, and could not, or would not, answer any questions. A small scar was seen on the top of his head, to the right of the median line and just behind the coronary suture. Temperature 103° F.; pulse 130. The symptoms indicated a brain-abscess, and, after consultation with Dr. Crego, exploratory trephining was advised, and performed immediately.

A downward convex incision was made circumscribing the scar. After the periosteum had been removed a small opening filled with granulations was seen in the skull. A half-inch button was removed with the trephine outside the hole, and a rim of bone removed around the hole with cutting-forceps (Keen's). The dura mater thereafter bulged into the opening, was not pulsating, and a granulating ulcer found corresponding to the hole in the skull. The dura was opened, and just beneath the granulation a stream of pus gushed out from an abscess-cavity beneath the cortical substance. The opening was enlarged with dressing-forceps, and about two ounces of pus evacuated. The cavity seemed, by exploration with the finger, to be about the size of a large egg. It was irrigated with sterilized water, loosely packed with iodoform-gauze, let out through an opening in the flap corresponding to the deeper opening. The wound was thereafter sutured and antiseptic dressings applied.

November 23, he rested quietly during the night, and seems much brighter, says he feels "first rate" and wishes to get up. Pulse 120; temperature 101° F.

November 24, wound dressed and irrigated, and iodoform again introduced.

November 26, temperature 99° F. Wound was thereafter irrigated and dressed every other day; a small strip of iodoform gauze introduced for drainage. The pus-discharge diminished rapidly, and he left the hospital convalescent on December 10.

From a letter from his physician, of January 16, 1894, I quote: "Mentally and physically the child seems to be perfectly well; has gained in weight, and is as active as ever. The discharge of pus ceased shortly after his leaving the hospital, and the wound is nearly healed."

The interest in this case is the entire absence of paralysis, although the abscess evidently was near the motor-centre, and must have exerted considerable pressure on this point. The diagnosis was made on the symptoms of mental dulness and elevated temperature.

CASE III.—*Trephining for Epilepsy; Recovery.*—For the history of the following case I am indebted to Dr. W. C. Krauss, of Buffalo. W. T., of Attica, N. Y., aged twenty-four, height five feet eight inches, weight 165 pounds, constitution strong and healthy. Nothing in his antecedents and early life is worthy of special consideration. When twelve years of age an accident befell him on a Fourth of July, which proved to be the cause of his later misfortune. Some boys, having procured the barrel of an old gun, were engaged in discharging it to help celebrate our national holiday. The gun flew into the air, and on descending struck the patient on the left frontal region of the head. He was carried unconscious to a physician's office, who removed several small bone particles of the skull, and sewed up the wound. Suppuration set in, which continued for a few weeks, and the boy seemed to have recovered fully from the effects of the injury. About six years ago, six years after the accident, he began to notice that he felt unusually drowsy, dull, and stupid on awakening in the morning. This condition lasted for some time; the cause undiscovered until he was discovered in an epileptic attack by his room-mate. He consulted several physicians without obtaining any relief. In the fall of 1890 he consulted Dr. Krauss, who, without any success, prescribed bromides. He made a thorough examination, and found a large, deep depression over the left frontal bone, the posterior edge extending through the coronary suture. Up to this time he had been able to work hard on a farm, but would have the nocturnal attacks.

On May 2, 1891, Dr. Krauss was called to Attica to see him and found him in one of the attacks. He was sitting in a chair, his eyes wide open, glassy staring, his head drawn to the left, speechless, but not exhibiting any signs of convulsions. These attacks were growing more frequent, had become diurnal as well as nocturnal, and some radical procedure was demanded. Two days later Dr. Krauss was again called to Attica, and I was requested to accompany him and operate. On our arrival we found the patient in the *status epilepticus;* the attacks being no longer intermittent, but continuous without

longer intervals than a couple of minutes. He had been in this condition for thirty hours, one attack of convulsions following the other without the patient regaining consciousness. The pulse was weak and rapid, face cyanotic. A large depression, covered with a tight, whitish, adherent scar, was seen as described. A large, curved incision, convex backward, was made, the scalp loosened with difficulty from the bone, and an irregular defect of bone found under the scar. The surrounding edges of the bone were much hypertrophied, strongly adherent to the dura and pressing it inward. The dura was loosened all around from the hypertrophied bone, which thereafter was removed all around the defect, except anteriorly, with cutting forceps.

During the following day he had six attacks, but thereafter he improved rapidly, and he soon returned to his work a well man. No attacks occurred for seventeen months; he got married and felt well, but continued the treatment with bromides. On October 7, 1892, he consulted Dr. Krauss again, and stated that the attacks were returning, and were becoming daily more frequent. Dr. Krauss advised him to enter the Sisters' Hospital in Buffalo, in order that he could be under observation and treatment. The attacks, similar to the ones he had at first, grew daily more frequent and intense, and after three days he was in the same condition of *status epilepticus*. An operation similar to the first, but convex forward, where the bone could not be reached during the first operation, was performed, hypertrophied bony edges, strongly adhered to dura mater, found and removed, and the dura again widely loosened from the bone with Horsley's spatula.

He recovered rapidly, having some attacks only during the following twenty-four hours, and was discharged from the hospital on November 6, 1892, apparently cured. He was again treated by Dr. Krauss with bromides, his food restricted, and all work prohibited for six months. Thereafter he resumed his farm work. He has since had no more attacks or peculiar feelings; his physical and mental condition, Dr. Krauss states, are excellent, and we hope for no further trouble. The depression is covered by his hair, and gives him no concern whatever. The interest in this case is the late appearance after the injury, the apparent recovery after the first operation, relapse and a still further remission, and possible cure after a second operation. It is the belief of Dr. Krauss and Dr. Crego, who saw him the second time, that death probably would have occurred if he had not been operated upon.

OBSERVATIONS UPON APPENDICITIS.

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[CONCLUDED FROM PAGE 491.]

An Analysis of 169 Personally-Observed Cases of Appendicitis.

IN studying the symptoms and conditions present in the series of cases of appendicitis herewith presented, due regard has been given to those practical questions involved in the etiology, diagnosis, and treatment of the disease. These relate mainly to: (1) the disease and its complications, and (2) to the operative procedure and its results.

The principal facts bearing upon the disease and its complications are grouped as follows: (1) Sex; (2) age; (3) previous attacks; (4) the symptom of constipation; (5) the method of onset; (6) the symptom of abdominal pain; (7) the symptom of vomiting; (8) the symptom of abdominal tenderness; (9) the symptom of chill or rigor; (10) the symptom of fever; (11) the symptom of muscular tension; (12) the symptom of tumor; (13) the complications and sequelæ of the disease.

The principal facts bearing upon the operative procedure and its results are grouped as follows: (1) The various incisions employed; (2) the adhesions encountered; (3) the condition of the peritoneal cavity; (4) the various methods of dealing with the appendix employed; (5) the clinical anatomy of the appendix as disclosed by the operation; (6) the condition of the appendix when removed; (7) the presence or absence of foreign bodies or fæcal matter in the cavity of the appendix; (8) the relation between the time of the operation and the result in acute cases;

(9) complications and sequelæ of the operation; (10) the subsequent history and mortality in cases operated upon, but in which the appendix was not removed; (11) a summary of the results of the operation; (12) an analysis of cases not operated upon; (13) cases in which the diagnosis was doubtful, the presence of appendicitis was suspected, but in which exploratory operation revealed conditions other than appendicitis.

The Disease and its Complications.

Sex.—Of the total number of cases coming under observation up to this time, 169 in number, the disease occurred 142 times in males and 35 in females.

The relation of the sex of the patient to the frequency of the disease is a matter of general comment. It has been suggested that its apparently less frequent occurrence in females heretofore was due to the increased difficulties in diagnosis, owing to the fact that acute diseases of the uterine adnexa simulated, to some extent, appendicitis, and that the disease really occurs with as great frequency in the female as in the male, but that it is more frequently overlooked in the former. While this seems plausible at first sight, the experience of those who have of recent years been brought in contact with the disease and have observed a large number of cases still seems to essentially bear out the views originally held,—viz., that the disease occurs in males from four to five times as frequently as in females.

The reasons advanced for this very decided comparative immunity of the female sex from appendicitis have been unsatisfactory heretofore. Morphological differences would naturally first attract the attention of the original investigator. The presence or absence of structural variations have not, to my knowledge, been determined as between the two sexes. Histologically, so far as I am aware, the appendix of the female is identical with that of the male. In its location and direction, the differences are not sufficiently marked to even base a theory upon.[1] The nerve-supply is believed to be precisely the same in the two sexes.

The existence of a process of peritoneum passing from the

[1] See Prof. J. D. Bryant's table, Annals of Surgery, February, 1893, p. 164.

right ovary to the meso-appendix (the appendiculo-ovarian ligament of Clado) was not demonstrated to exist in but a single instance in ten cases studied with reference to this point. When present, it is believed to assure some degree of immunity against the disease by increasing the blood supply, and thus increasing the local vital resistance.

The only other anatomical variation, as occurring between the sexes, which has been noted, is that relating to the arrangement of the lymphatic vessels. Between the folds of the appendiculo-ovarian ligament of Clado, the latter observer has noted the existence of lymphatic channels which establish a communication between the lymphatics of the ovary and those of the appendix. In how far this freedom of communication between the lymphatic vessels of one organ and those of another may serve in affording protection of either the one or the other against diseased conditions cannot, in the light of our present knowledge, be intelligently discussed. While, generally speaking, the lymphatic vessels of the appendix pass directly into the appendicular lymphatic ganglion which lies in the angle formed by the appendix and the cæcum, this arrangement may vary, particularly in the case of the female. In at least one instance of appendicitis occurring under my observation in a female child of eight years, there existed a chain of enlarged lymphatic glands along the free border of the meso-appendix. Some of these were as large as the tip of the little finger, and were so located as to bring more or less pressure to bear upon the appendicular artery. The appendix, in this case, was gangrenous at its distal extremity.

Age.—The age of the youngest in the series was two and a half years, while that of the oldest was sixty-eight. The first named was a case in which the disease was evidently of tubercular origin, and tubercular peritonitis followed. This was the only case which occurred under five years of age. Eight cases were between five and ten years; twenty-one were between ten and fifteen; twenty-nine were between fifteen and twenty; forty-three were between twenty and twenty-five; twenty-three were between twenty-five and thirty; twenty-eight were between thirty and forty; and sixteen were over forty.

It is evident that the disease is comparatively rare at the two extremes of life; that it is most frequently observed during the period of life representing, first, the most rapid growth of the individual, and, second, that in which the greatest functional activity is present, is also apparent. The greater preponderance of living individuals under forty might account to some extent for the comparative infrequency of the disease in those at and above middle life, but this does not account for its comparative infrequency at certain other periods of life.

While it is true that the lymphoid element, of which the appendix is largely made up, is usually most abundant in children, it is by no means absent in the aged. The appendix is rich in lymphoid tissue in children under five years of age. Kelynack has observed it in abundance in an old woman of sixty-two. In a new-born child he likewise found the Lieberkühn crypts exceptionally numerous and well-marked. The structure of the appendix in this respect is strikingly like that of the tonsil, and, like the latter, presents a lessened resistance to the influences which produce diseased conditions. The proportion of lymphoid tissue present at the different periods of life does not present sufficient variations to serve as an etiological factor in determining its occurrence at one time of life oftener than another.

It has been asserted that differences in the arrangement of the mucous membrane about the appendico-cæcal aperture, which forms, by its loose and somewhat folded shape, a sort of valve, first described by Gerlach, exist between this as found in youth and in old age. Such differences, if they ever exist, are not by any means constant, inasmuch as this anatomical peculiarity forms only an insufficient valve at best, is most frequently but a slight ridge or prominence, and may be absent altogether at any period of life. Both Kelynack and Clado, as well as Lafforgue, deny that any such valve exists. Variations in this particular, as well as in the actual size of the orifice of communication between the appendix and the cæcum, occurring as between young adult life on the one hand and old age upon the other, and which are not present at either extreme of life, have yet to be demonstrated. A large orifice is probably a safer

arrangement than a smaller one, if the pathological importance usually attributed to the presence of fæcal matter is to be taken into account. This probably enters as a semifluid mass, and becomes inspissated while in the cavity of the organ. Under such circumstances, a small orifice, while permitting the ingress of fæcal matter, would prevent its egress, after its watery constituents had been removed, and it had shaped itself to the lumen of the appendix. Fæcal masses thus imprisoned may act as casual factors in the causation of the disease, but that whatever valve which controls the opening disappears with age, or that the orifice itself becomes widened with advancing years from atrophy of the mucous membrane at this part of the cæcum, cannot be admitted without more accurate observations upon this point.

Previous Attacks.—The number of cases in which this point was noted was 162. Of these twelve had suffered from one previous attack; eighteen had suffered from two attacks; eight had suffered from three attacks; and fifteen had suffered from more than three attacks. The longest time covered by the interval between the first attack and the present one was twelve years.

In the study of the question of previous attacks and the influence which an attack that has been recovered from possesses in the establishment of a predisposition to subsequent attacks, due attention must be paid to the probable pathological changes which follow the primary attack. If these have been but slight in extent, and particularly if they do not involve extensive lesions of the vessels or nerves, or alterations in the lumen of the organ or in the size of the appendico-cæcal orifice, entire recovery may ensue, and all traces of an involvement of the organ, so far as symptoms are concerned, at least, disappear. On the other hand, endarteritis obliterans and changes in the peri- and endo-neurium, as first observed by Prof. Van Cott, contraction or closure of the opening leading to the cavity of the cæcum, or obliteration of this altogether,—or with or without this change, the occurrence of a stenosis of any portion or portions of the appendix, without doubt, leads to a condition of affairs incompatible with complete recovery, as a rule, and a chronic inflammatory condition supervenes, due to lowering of the local vital resistance from circula-

tory disturbances and lesions of the trophic nerve-fibres, the retention of secretion within the closed cavity and continued but slow reinfection—or all of these influences combined.

This constitutes the type known as chronic appendicitis. The occurrence of an indefinitely prolonged chronic condition, without the supervention of relapses more or less acute in character, however, is probably of rare occurrence. The lowered vital resistance, combined with the presence of micro-organisms in the retained secretion, the latter of which forms a favorable soil or culture medium for the propagation of the former, lead, sooner or later, to a reinfection of sufficient virulence to induce either a subacute attack or a relapse to the conditions present in the primary attack. In this manner an acute attack is engrafted upon a chronic condition, and what is known as the chronic relapsing variety is produced.

Of the fifty-one cases operated upon in which a history of one or more previous attacks was elicited, thirty were cases in which a chronic condition had supervened; of these eight were operated upon in an acute relapse, and are classified among the acute cases operated upon. The remaining twenty-two cases were of the same class (*i.e.*, chronic relapsing cases), but were operated upon between the relapses, or in the period of so-called quiescence.

The relapses in these cases of the chronic relapsing form of the disease are not necessarily of an acute character. In one case in my list a large number of subacute relapses, amounting to at least fifty in number, and extending over a period of eight years, occurred prior to the acute perforative attack during which he was finally and successfully operated upon. In another case the patient was able to identify thirty such attacks. This was also operated upon in an exceptionally acute attack and recovered. In a third case, that of one of my old hospital *internes*, the patient suffered thirteen relapses in less than two years. This case was successfully operated upon in the interval of the disease.

The Method of Onset.—In the great majority of cases the onset of the attack was sudden. Of the entire number upon which this study is based (169), but eight occurred in which the attack was not sudden in character. So pronounced a feature is

this, the sudden development of the primary symptoms of the disease that, in differentiating between this and conditions for which it may be mistaken, only those among the latter which, in common with appendicitis, are characterized by a sudden onset, are ordinarily taken into account.

The Symptom of Pain.—The first, and, at this stage of the disease, the most important of the cardinal symptoms of appendicitis is pain. This symptom ushered in the attack in 167 of the 169 cases; in the other two cases pain was present but followed, instead of preceding, the other symptoms. In one of these cases a chill was the initial symptom, while in the other vomiting occurred at the very outset. Contrary to what has been the general belief in the past, in not more than one-fourth of the cases is the pain referred, at the commencement of the attack, to the region of the appendix itself. In thirty-eight cases of the present series the pain was referred to the right iliac region. In the remaining cases it was first referred to either the peri-umbilical or the epigastric region, or both. In 119 of these the pain centred itself in the right iliac region in the course of from a half-hour to three hours, although the fact that the pain still continued to radiate to the neighborhood of the epigastrium frequently served to attract attention to the stomach as the source of the difficulty. Upon more than one occasion this circumstance has served to mislead the medical attendant, and led to delay in making a proper diagnosis. In four cases the seat of localized pain corresponded quite accurately with the site of a displaced cæcum; in three of these left-sided appendicitis existed, and in the other the cæcum was located behind the liver.

The pain was acute and lancinating in all of the cases except three; in two of these it subsequently assumed a lancinating character, while in the third it continued dull and localized. In all three cases the appendix was extraperitoneally located.

The Symptom of Vomiting.—This symptom was present in 141 out of 167 cases. This, therefore, must be looked upon as a comparatively frequent event among the symptoms referable to the digestive tract. The relation which the vomiting bears to the symptom of pain, in the order of their occurrence, is likewise

strikingly constant. In but a single instance did the vomiting precede the pain. In five instances the vomiting occurred within three hours of the pain. In the remainder the pain preceded the vomiting by periods of time varying from three to twelve hours. Of the twenty-six cases in which vomiting did not occur, nausea was present in twenty-four. In two cases both nausea and vomiting were absent.

That the symptoms of nausea and vomiting are to be looked upon as reflex phenomena rather than resulting from indigestion is suggested by the occurrence of these symptoms at a period of time more or less remote from the commencement of the attack, as well as the observation, repeatedly made, that the vomited material, when this consisted of partially digested food, was found to have reached a stage in the digestive process corresponding to the period of time which had elapsed since the ingestion of the last meal. It is nevertheless true that, in a large number of instances of the disease which I have seen in consultation when the most favorable time for a safe operation had passed, the latter had been mistaken for an ordinary colic resulting from indigestion.

The Symptom of Constipation.—Of 117 cases studied with especial reference to this point, the occurrence of this symptom was noted in forty-three. Of these a history of habitual constipation was obtained in thirty-three. Of the latter class twenty-five were females. Of the remaining sixty-four cases, in eight diarrhœa preceded or accompanied the attack. In the remaining cases a normal condition of daily movement of the bowels existed.

As will be seen by the above, constipation does not play as important a rôle as a predisposing or exciting cause in my experience as has been attributed to it by others. Constipation has been looked upon in its ætiological relations to appendicitis, either, first, by fæcal stasis at this portion of the large intestine, during which fæcal matter is moulded into little masses by becoming embedded in the furrows between the ridges of mucous membrane of the cæcum near the appendico-cæcal aperture, and subsequently finding their way into the cavity of the appendix; or, second, by this same stasis producing circulatory

disturbances and setting up a catarrhal inflammatory condition in the cæcum which, by extension, invades the cavity of the appendix. An impaction of fæcal matter in the cæcum, by obliterating the folds which guard the entrance to the appendix, thus permitting infectious material to gain ingress to the lumen of the organ whose vitality has been lowered by circulatory disturbances or trophic nerve lesions, or both, would be quite as satisfactory an explanation as either of the above, providing the existence of Gerlach's valve could be established. The fact that constipation is a disorder rather wide-spread in civilized communities, and apt to be present in quite a large number of diseases at their outset, should not be lost sight of in this connection.

The Symptom of Abdominal Tenderness.—This symptom was present in all of the 169 cases. In 160 of the cases it was found to be present in the right iliac region in from one to six hours after the development of the first symptoms. In two cases which had advanced to the formation of large intraperitoneal collections of sero-purulent fluid, and which, prior to this development, were the subjects of provisional diagnoses in which the consideration of appendicitis did not enter, the statement was confidently made by the medical attendant that at no time was tenderness present in the right iliac region. In four cases tenderness existed elsewhere than in the right iliac region. In one of these an autopsy revealed the cæcum displaced upward and to the left, being located behind the umbilicus. In two cases the operative procedure revealed a similar location of the cæcum. These were three cases of left-sided appendicitis, in the first one of which the diagnosis was made post-mortem. In the two succeeding cases, bearing in mind the possibilities suggested by my experience in the first, a diagnosis of left-sided appendicitis was made before the operation. Happily, one of these was seen sufficiently early to permit of a successful issue; the other had suffered a rupture of an appendical abscess and perished in consequence of the septic processes in progress before the operation. In one case the tenderness was demonstrated to exist in the neighborhood of the gall-bladder; the operative procedure revealed the presence of the cæcum behind the right lobe of the liver.

When the tenderness is strictly localized within an exceedingly small area, such, for instance, as would be represented by the finger-tip, it is known as point-tenderness. I am not at all certain that this symptom possesses the degree of importance frequently attributed to it, save in the very commencement of the existence of the tenderness, when, as pointed out by McBurney, it is of decided value. The impingement of a single finger-tip, crowded with only moderate force into the centre of the right iliac region will cause pain, even in health. Much more reliance is to be placed upon the existence of marked tenderness upon slight pressure in the right iliac region in general than upon tenderness which can only be elicited by considerable pressure, and within an area corresponding in size to the tip of a single finger. Where more or less diffused tenderness exists in the right iliac region, and to this is added a single point where the tenderness is extreme, this corresponding to the right rectus muscle at its dextral margin, and to a very small area, this symptom of point tenderness becomes of considerable diagnostic importance. In the absence of symptoms other than tenderness at a point which can be covered with a single finger-tip, care should be exercised lest too much stress be laid upon this symptom.

Tenderness was frequently elicited, particularly after the first thirty-six to forty-eight hours, when adhesions had formed, by making pressure upon portions of the abdominal wall more or less remote from the site of the appendix. The tenderness was felt in the right iliac region, under circumstances of normal position of the cæcum, although the pressure was made elsewhere. Its presence is believed to be due to dragging upon adhesions about the appendix, or the disturbance of the inflamed structures involved in the inflammatory process, in consequence of the transmitted pressure. In seventeen out of twenty cases in which the disease had advanced beyond the second day, and which were studied with reference to this point, pressure transmitted to the right iliac region from elsewhere in the abdominal region produced pain in the former locality.

In twenty-seven out of thirty-nine cases, studied with refer-

ence to this point, adhesions were found to have formed between the dextral surface of the caput coli and the lateral pelvic wall upon and after the second day. In consequence of this, pressure along the line of Poupart's ligament gave rise to a degree of tenderness not to be obtained elsewhere. This was due to dragging upon the inflamed parts by the above-mentioned adhesions when pressure was made which tended to push the caput coli towards the median line.

Tenderness in the loin has heretofore been thought to be a symptom of some importance, particularly in those instances in which the appendix is located extraperitoneally. In five out of 130 cases this symptom was present. In two of these there was perforation posteriorly and infection of the retroperitoneal connective tissue. The fact as to whether the appendix was or was not located extraperitoneally could not be ascertained in these cases owing to the suppurative changes present. In the other three cases the extraperitoneal location of the appendix could be demonstrated. In this connection it may be mentioned that in two other cases which have come under my observation, although an extraperitoneal location of the diseased appendix was shown to exist by the operative procedure, yet tenderness in the loin was absent.

The Symptom of Chill.—In six cases of the entire number a chill accompanied the first symptom of pain. In only two instances did this amount to a rigor. In the remaining four cases chilly sensations were complained of.

The occurrence of decided rigors is certainly not a prominent feature of the disease at any time in its course. Even in cases which pursue a suppurative course chills do not occur so frequently as in suppurative conditions elsewhere.

The Symptom of Fever.—More or less febrile action followed the onset of the attack in 150 out of the 157 cases. In the remaining six cases fever occurred after six hours. In two of these the occurrence of fever was postponed until the second day of the disease. The highest temperature noted was 104° F. This was a case in which the disease occurred in connection with an attack of epidemic influenza. Ordinarily the temperature ranged from

99.4° to 102.5°F. during the first forty-eight hours. In three cases the temperature and pulse fell to normal just before the occurrence of primary perforation. In eight out of twenty-three cases of rupture of an encysted intraperitoneal sero-purulent collection, a decided lowering of the temperature and lessening of the pulse-rate took place just prior to the occurrence of this invariably fatal accident.

The variations of pulse and temperature in this disease are such as to frequently mislead the practitioner as to the probable termination of the case. That absolutely no reliance is to be placed upon these as prognostic indications, particularly where they would seem to point to a favorable issue, cannot be too strongly insisted upon. Unless these as favorable prognostics are supported by an amelioration of other and more trustworthy symptoms, they should scarcely enter into the consideration at all.

The Symptom of Muscular Tension.—The presence or absence of this symptom is recorded in 126 cases. In eighteen of these, in which general peritonitis existed, the entire muscular wall of the abdomen was either tense or rigid. A restriction of the tension or rigidity to the right rectus muscle was observed in ninety-nine cases. In ten cases, although the disease was well under way, the previous administration of opium had modified the tension to a greater or less extent. In two acute cases the tension was not marked up to the second day of the disease, although there had not been administered sufficient opium to allay the pain. In twenty cases (chronic relapsing cases examined during the interval) no tension existed. In three chronic relapsing cases a tender tumor could be made out, and slight spasm of the rectus muscle took place and tenderness was elicited, upon pressure. The muscles of the loin were rigid in addition, or more or less tense, in five cases. Lordosis was observed in one case, that of a child. Flexion of the thighs upon the abdomen, due to tension of the extensor muscles of the thigh, was observed in three cases, exclusive of those in which general peritonitis existed.

This absence of flexion of the thigh, the occurrence of which was formerly regarded as one of the most frequent symptoms of

appendicitis, is worthy of note from a diagnostic point of view. If former observations upon this point are to be regarded as trustworthy, either the disease was restricted more frequently to instances in which the appendix was wholly or in part uncovered by peritoneum, or else the disease passed unrecognized until the surrounding peritoneal structures were extensively involved in the inflammatory process; most probably the latter. Cases which developed general peritonitis and perished prior to the development of this symptom were regarded as instances of idiopathic peritonitis, and lesions of the appendix or cæcum were not suspected. In this manner only can be explained the frequency of this symptom in former times in connection with cases of so-called typhlitis, as compared with the present.

The Symptom of Tumor.—In thirty cases of the series tumor was found to be present. The tumor made its appearance at periods of time varying from twenty-nine hours to six days following the onset of the symptoms. Some of these cases were seen by me late in the disease, when the tumor was first detected. In these the tumor was probably present earlier in the disease. The occurrence of a tumor at the end of twenty-nine hours may be considered quite exceptional, as it occurred in but a single case. In these twenty-nine cases are included eleven out of twenty-two cases of chronic relapsing appendicitis examined and operated upon in the period of quiescence.

The Operative Procedure and its Results.

One hundred and fifty-two cases of this series were subjected to operation by abdominal section.

The Incision.—In 117 cases the vertical incision, placed at the outer edge of the right rectus muscle, in the linea semilunaris, was employed. In twenty-nine cases the oblique incision in the right linea semilunaris, placed parallel with Poupart's ligament and with its centre opposite to the anterior superior spinous process of the ilium, was employed. In four cases the oblique T-incision, consisting of an incision carried from the centre of the oblique incision and at right angles to the same directly outward to the anterior superior spine. In one case an incision, supple-

mentary to the oblique incision, was carried from the upper limit of the latter obliquely upward and inward across the rectus, for the purpose of exposing the cæcum which was found to lie behind the liver, was used. In three cases a median abdominal section was made.

In the ordinary average case operated upon between the third and the fifth day the oblique and vertical incision have been found to be equally useful. They both permitted of a rather wide exploration and gave ready access to the parts about the cæcum. They were extended, when necessary, from either end sufficiently to gain ample room.

In cases operated upon in which tumor was present the incision was generally placed in such a manner as to include the longest diameter of the most prominent portion of the tumor. This brought the incision almost invariably in the direction of the oblique incision. In cases operated upon early in the attack, and in which a simple appendicectomy was done, as well as in recurrent cases operated upon in the interval and in chronic relapsing cases operated upon during the period of quiescence, the oblique incision was employed. The oblique T-incision was used in cases in which it was not deemed best to dispense with drainage altogether, but in which it was considered a desideratum to close immediately the primary incision in the abdominal wall. In these cases a small gauze drain was brought out of the portion of the incision running towards the anterior spine, the oblique incision being closed. In this manner drainage was secured, and that portion of the wound which was the last to close, and which necessarily thereafter constituted the weakest portion of the abdominal wall, was so placed as to be the least likely to give rise to ventral hernia.

In the majority of the cases operated upon, in which no pus or sero-purulent fluid was thought to be present, the Trendelenburg position was chosen. The pelvis of the patient was raised about one-fourth the distance assumed in the complete Trendelenburg position, in the commencement in all acute cases in which doubt existed as to the presence or absence of fluid about the appendix. This position, while it gives the assistant good control of the

intestines, is convenient to the operator, and permits turning the patient upon his right side in case it becomes necessary to obtain the aid of gravity in getting rid of fluid about the site of the operation. With the table at an angle representing about one-fourth that assumed in the complete Trendelenburg position, the patient is placed most conveniently in relation to the operator and his assistants; this position is also sufficiently near to the horizontal to permit of ready manipulation in cases in which an abscess or encysted intraperitoneal fluid is present.

The length of the incision necessarily varied according to the necessities of the individual cases. In those operated upon in the intervals of quiescence among the recurrent and chronic relapsing cases, it was possible to secure sufficient room for the removal of the organ by the employment of an incision from one and a half to three inches in length. In cases in which it was found necessary to follow encysted intraperitoneal collections of sero-purulent fluid, more extensive incisions were found to be necessary in order to cleanse and drain these thoroughly. In instances of abnormally-placed or extraordinarily-long appendices the original incision, whether obliquely or vertically placed, was extended in a direction either upward or downward, to meet the exigencies of the particular case. In some instances, under these circumstances, an eight- or nine-inch incision became necessary.

The Adhesions.—The rapidity with which adhesions formed was found to vary greatly in different cases. Protecting walls of adhesions were found to be absolutely absent at the end of forty-eight hours in ten cases. In five cases no adhesions were found at the end of three days. In seven of these fifteen cases primary perforation of the appendix occurred. In twenty-two cases operated upon adhesions had formed and subsequently given way, permitting general infection of the peritoneal cavity. In addition to these, five cases were observed in which the patients died without operation, the autopsy revealing as the cause of death septic peritonitis due to ruptured adhesions. The time from the beginning of the attack to the death of the patient in these cases averaged four and a half days.

The Condition of the Peritoneal Cavity.—In two cases there

was general peritonitis without rupture of adhesions. In both of these the serum was clear. In both the patients recovered. In six cases slightly turbid, milk-like fluid, or serum which had become infected, was present without general peritonitis. Five of these recovered; one died of general sepsis.

In thirty cases peritonitis from direct infection through the medium of the contents of an appendicular abscess, of an encysted sero-purulent focus, or from perforation of the appendix itself into an unprotected peritoneal cavity was found. In all these cases the fluid was sero-purulent. In twelve fæcal matter was also present. A fatal termination invariably followed this method of infection of the peritoneum.

Methods of Dealing with the Appendix.—In 116 cases the appendix was removed. In thirty-nine cases it was ligatured, excised, and carbolic acid applied to the stump. In fourteen cases it was ligatured, excised, and fuming nitric acid applied to the stump. In forty-eight cases it was ligatured, excised, and the thermo-cautery applied to the stump. In eleven cases the peritoneal covering of the appendix was circularly divided, a cuff-shaped flap consisting of the serosa reflected, the remaining walls of the organ ligatured as close to the cæcum as possible by a catgut ligature, and amputated distal of the ligature. The mucous membrane projecting from the stump was then cauterized, and this sunk in a furrow produced by crowding the stump against the outer surface of the cæcal wall. The margins of this furrow were then closed over the stump, thus burying the latter completely between peritoneal surfaces, by the application of a Lembert suture. Woelfler's mixture, consisting of iodoform one part and compound tincture of benzoin ten parts, was painted over the line of suturing. In fifteen additional cases the above procedure was carried out with the exception that the ligature was applied to the entire wall of the appendix, circular division and reflection of a cuff of peritoneum being omitted. In six cases the condition of the appendix was such as to prevent the application of a ligature. In four of these a clamp forceps was applied to close the opening into the cæcum. In one case even this could not be successfully accomplished, but inasmuch as the appendix in this

case was situated extraperitoneally, the wound-cavity was simply tamponed with gauze. The case recovered in spite of the fact that septic pneumonia was present at the time of operation.

In three cases the stump of the meso-appendix was sutured to the cæcal wall at the site of the buried stump of the organ, with the view of still further adding to the solidity of the cæcal wall at this point, as well as doing away with the necessity of leaving a raw surface of peritoneum in the abdominal cavity, with its attendant dangers of viscous adhesions and intestinal obstruction from angulation.

The Clinical Anatomy.

The relation of the appendix with reference to a line drawn from the anterior superior spinous process of one side to that of the other, as well as the direction of the organ, was noted in 123 cases. The results appear in the following table:

Class A. Colon Normally Placed.

(1) Appendix above the transverse line: Line N.W., 12; line N., 7; line N.E., 6. Total 25.

(2) Appendix parallel with the transverse line: Line W.; 8; line E., 5. Total 13.

(3) Appendix below the transverse line: Line S.W., 29; line S., 24; line S.E., 20. Total 74. (Of those in the S.E. direction, 10 passed into the pelvis.) Total number in Class A, 112.

Class B. Colon Abnormally Placed.

In the pelvis, 4; in the left iliac fossa, 1; sinistrad of the umbilicus, 2; behind the umbilicus, 1. Total number in Class B, 8.

In addition to these, in one case, the appendix passed first in the S. direction, then E., then W., and then N., assuming the shape of an inverted interrogation-point. In one case it passed first N.W., and then, with a sharp bend, it passed directly in the S. direction. The appendix, in this case, had been forcibly pressed against the lateral pelvic wall, between the latter and an over-filled colon, and ulceration and perforation had taken place

at the angle. In one case the appendix was corkscrew-shaped, with the general direction S.[1]

In only three cases of the entire series was the appendix identified as having an extra peritoneal location. In one case the fœtal type of the organ persisted. In this case the sinistral surface of the colon had developed at the expense of the dextral surface; the funnel-shaped base of the appendix was implanted upon the outer wall of the cæcum.

Condition of Appendix upon Removal.

The condition of the appendix when it was removed in the 129 cases in which this was noted was as follows:

(1) *Simple Inflammation of the Organ.*

Inflammation of the mucous membrane alone	1
Serous inflammation of the walls of the appendix, in addition to inflammation of the mucous membrane	13

(2) *Suppurative Inflammation of the Organ.*

Distended with pus (acute cases	2
Multiple abscesses of the walls of the appendix	1

(3) *Gangrenous Appendices.*

Gangrene of the entire organ	11
Gangrene of the peripheral portion	20
Gangrene of the central portion, including four that had sloughed entirely away from the cæcum at the base	13
Gangrene of the walls alone	1
Gangrene of the mucous membrane alone	2
Gangrene of the tip, combined with ulceration and perforation elsewhere in the organ	6

(4) *Ulcerated Appendices.*

Ulceration with perforation	33
Ulceration without perforation	1

Changes in Chronic Relapsing Cases Operated upon in the Interval between the Attacks.

(1) Thickened, with traces of exudative inflammation, but no other changes	6
(2) Fibrous degeneration and obliteration of the cavity of the organ	3

[1] In the course of other abdominal sections I have observed the appendix in the following locations: In the scrotum with intestine and omentum, 2; in the sac of a femoral hernia, 2; in the sac of an umbilical hernia, 1.

(3) Stenosis and cystic dilatation, with muco-pus in the cavity:

Perforated	5
Non-perforated	6
Total	11

(4) Stenosis and angulation, with dilated cavity and muco-pus in cavity 2

(5) Tubercular ulceration 1

Changes in Recurrent Cases Operated upon after Two or More Attacks.[1]

(1) Meso-appendix shortened at its middle and thickened; organ corkscrew-shaped 1

(2) Organ thickened and adhesions present 1

(3) Appendix completely enclosed in a veil-like process of the peritoneum; organ the seat of chronic inflammatory changes 1

Presence of Foreign Bodies or Fæcal Matter.

In two instances foreign bodies were found. One of these, a true enterolith, was found in the appendix, while the other, a gall-stone, was found in an abscess-cavity surrounding an appendix which had sloughed away from the cæcum. In twenty-four instances small masses of fæcal matter, more or less inspissated, were found, either in the appendix itself or in surrounding purulent or sero-purulent collections.

[1] These cases are here denominated simply recurrent cases. While, clinically speaking, this is probably correct from the pathological stand-point, they should be considered as cases of chronic appendicitis.

TABLE SHOWING THE RELATION BETWEEN THE TIME OF THE OPERATION AND THE RESULT IN 127 ACUTE CASES.

Time of Operation.	No. of Cases.	Recovered.	Died.	Complications in Cases which Recovered.	Complications and Causes of Death in Fatal Cases.
First day	2	1	1		La grippe; pneumonia.
Second day	22	19	3		Primary perforation; septic peritonitis before operation.
Third day	34	28	6	Appendix could not be removed with safety in one case.	Perforation of appendix in four cases, with septic peritonitis before operation; in two cases angulation from viscous adhesions.[1]
Fourth day	9	6	3		In one case the patient's condition was such as to prevent removal of appendix; two cases died of pre-existing peritonitis, and one of intestinal obstruction.[2]
Fifth day	13	7	6	It was not deemed best to remove the appendix in two of these cases.	Two cases died of pre-existing peritonitis; one died of hæmorrhage of the iliac vein; one of ileus;[3] one of intestinal obstruction, and septic peritonitis from gangrenous inflammation of the peritoneum, covering the lateral pelvic wall, and of the outer wall of the colon as well; the obstruction was due to the combined effects of angulation and intestinal paralysis. One died of extraordinarily rapid general sepsis. An intensely gangrenous condition of the limiting wall of adhesions existed in this case.
Sixth day	13	8	5	In one case which recovered it was not deemed prudent to remove the appendix.	In two of the fatal cases the condition of the patient did not permit prolonging the operation to the extent of removing the appendix; all five died of pre-existing septic peritonitis.

[1] Post-operative. [2] The intestinal obstruction in this case was due to the appendix acting as a constricting band. [3] Post-operative.

TABLE SHOWING THE RELATION BETWEEN THE TIME OF THE OPERATION AND THE RESULT IN 127 CASES—CONTINUED.

Time of Operation.	No. of Cases.	Recovered.	Died.	Complications in Cases which Recovered.	Complications and Causes of Death in Fatal Cases.
Seventh day	14	6	7	In four recoveries it was not deemed prudent to remove the appendix.	Septic peritonitis from rupture of limiting walls of adhesions before operation.
Eighth day	4	2	2	Inability to identify and remove appendix with safety in one case.	Septic peritonitis from rupture of limiting walls of adhesions occurring before operation.
Ninth day	1		1		Septic peritonitis had existed for forty-eight hours prior to the operation.
Tenth day	8	3	5	In two cases it was impossible to remove the appendix with safety.	Pre-existing septic peritonitis.
Eleventh day	1	1		Appendicular abscess.	
Twelfth day	1	1		Appendicular abscess.	
Thirteenth day	2	1	1	Appendix formed a portion of abscess wall in "E" position; not removed.	Large encysted intraperitoneal collection ruptured two hours before operation.
Fourteenth day	1	1		Appendicular abscess; the appendix sloughed away; fæcal communication; tedious convalescence.	
Fifteenth day	1		1		Tetanus.
Seventeenth day	1		1	Appendix could not be removed with safety.	Septic pneumonia.
Sixth week	2	2		Prolonged convalescence before final closure of an enormous abscess cavity, in one case; persistent fæcal fistula which finally required a secondary operation for its closure in the other; in one case the appendix could not be removed with safety.	

Complications and Sequelæ of the Disease in Cases Operated Upon.

Complication or Sequel.	No. of Cases.	Result.		Influence upon Clinical Course in Cases which Recovered.	Cause or Manner of Death in Fatal Cases.
		Recovered.	Died.		
Septic peritonitis { suppurative	30	. . . .	30	Long febrile course and tedious convalescence.	Sepsis and exhaustion.
Septic peritonitis { non-suppurative	2	2	. . . .		
Pregnancy[1]	4	. . . .	4	. . . . .	These cases also died of a pre-existing septic peritonitis.
Iliac phlebitis { two on one side	5	5	. . . .	Tedious convalescence.	
Iliac phlebitis { one on left side					
Iliac phlebitis { two on both sides					
Pelvic phlegmon	1	1	. . . .	A second laparotomy performed at the end of three months.	
Hæmorrhage from iliac vein . . .	1	. . . .	1	. . . . .	Exhaustion.
Puerperal state	2	2	. . . .	None.	
Lumbar phlegmon	5	4	1	Delayed convalescence.	General septic infection.
Parietal phlegmon	3	3	. . . .	Prolonged convalescence.	
Tubercular enteritis	1	. . . .	1	. . . . .	Case of recurrent appendicitis operated upon in intervals between attacks.
La grippe	1	. . . .	1	. . . . .	Double pneumonia developed.
Intestinal obstruction in which the appendix itself acted as a constricting band.	1	. . . .	1	. . . . .	Patient failed to rally from the condition of prostration which existed prior to operation.
Intestinal obstruction due to viscous adhesions binding the ileum to the cæcum, producing angulation; fæcal vomiting on sixth day.	1	. . . .	1	. . . . .	Exhaustion and septic peritonitis.
Septic pneumonia	2	1	1	. . . . .	A large, purulent collection had formed in the postperitoneal connective tissue, which had found its way in an upward direction to a level with the posterior attachments of the diaphragm.

[1] The four pregnancy cases are also included in the cases which died of septic peritonitis.

Complications and Sequelæ of Operation.

Complication or Sequel.	No. of Cases.	Result.		Influence upon Subsequent Course in Cases which Recovered.	Cause or Manner of Death in Fatal Cases.
		Recovered.	Died.		
Intestinal obstruction from ileus . .	1	. . . .	1	. . . . .	Accident occurred in the fourth week; original wound completely closed; a portion of intestine became twisted upon itself at its mesenteric attachment; a second laparotomy was done.
Intestinal obstruction from angulation.	2	. . . .	2	. . . . .	These occurred from the third to the fifth day, and were due to viscous adhesions; secondary laparotomy was done.
Tetanus	1	. . . .	1	. . . . .	Occurred on ninth day; patient lived in farming district on Long Island.
Gangrene of the abdominal wall . .	1	1	. . . .	Rapid gangrene beginning on second day; complication considerably retarded convalescence; a pure culture of *bacillus pyocyaneus* was obtained from a bleb filled with serum upon the abdominal wall, and also from the tissues removed from the gangrenous area.	
Ventral hernia	2	. . . .	. . . .	Bulging at the site of the cicatrix at the end of a year; a simple elastic bandage sufficient to prevent any discomfort.	
Fæcal communication	6	6	. . . .	Discharge of fæcal matter occurred from wound between second and fifth day; complete healing took place without further operative interference in five cases; one required operation.	
Mucous fistula	4	4	. . . .	Slight mucous discharge from a fistula which led down to the stump of the appendix; finally healed; occurred in cases in which carbolic acid was applied to the stump.	

SUBSEQUENT HISTORY AND MORTALITY IN CASES OPERATED UPON, AND IN WHICH THE APPENDIX WAS NOT REMOVED.

Of twenty-five cases in which the appendix was not removed there were seventeen recoveries and eight deaths. In the fatal cases the condition of the patient, due to septic peritonitis, was such as to prohibit the prolonging of the operative procedure to the extent of searching for and removing the appendix. Of the seventeen recoveries two suffered in the course of the next two years from a subsequent attack, and one of these proved fatal. The time that has elapsed without recurrence of the attack in the remaining cases, so far as can be ascertained, is as follows:

3 years and 9 months	1 case
3 " " 6 "	2 cases
2 " " 7 "	1 case
2 " " 6 "	1 "
2 " " 3 "	1 "
2 " " 2 "	1 "
2 " " 1 "	1 "
2 " " 11 "	2 cases
2 " " 10 "	2 "
2 " " 8 "	1 case
5 "	1 "
2 "	2 cases

SUMMARY OF RESULTS OF OPERATION.

Total number of cases operated upon		154
Died from causes attributable to the operation	4	
Died from causes existing prior to the operation	39	
Total number of deaths	43	

CAUSES OF DEATH.

(1) *Acute Cases* (*Primary and Recurrent*).

A. Due to the disease.

Septic peritonitis	32
Septic pneumonia	1
Hæmorrhage from iliac vein from extension of gangrenous process	1
Intestinal obstruction	1
Gangrene of adjoining colon and of lateral pelvic wall; septic peritonitis; intestinal obstruction from angulation and intestinal paralysis combined	1[1]

[1] It is doubtful whether this case should be placed among deaths due to the disease or to the operation. The gangrenous conditions surrounding the appendix, however, were probably the cause of the septic peritonitis.

Gangrene of wall of adhesions; rapid general sepsis . . 1

B. Due to the operation.

Intestinal obstruction, ileus 1
Intestinal obstruction, angulation 2
Tetanus 1

(2) *Recurrent Cases Operated Upon in Interval between Attacks.*

Number of cases 5
Recovered 5

CHRONIC RELAPSING CASES.

(1) Operated upon in acute relapse 8
Recovered 7
Died . . . . . 1[1]

(2) Operated upon in period of quiescence 22
Recovered 21
Died . . . . . 1[2]

[1] This had developed, prior to operation, into an acute and rapidly progressive case of septic peritonitis.

[2] Tubercular ulceration of the ileum.

Cases not Operated Upon.

No.	Sex.	Age.	Course.	Result.	Remarks.
1	M.	68	Mild case of endoappendicitis. Tenderness began to subside at the end of 24 hours.	Recovery.	No subsequent attack at the end of three years.
2	M.	8	Mild endoappendicitis preceding an attack of measles.	Recovery.	Suffered three relapses and was operated upon between attacks.
3	M.	36	Well-marked attack. Patient a physician who declined operation.	Recovery.	Subsequently developed into a chronic relapsing case and was operated upon.
4	M.	46	Attacked five days previously with an average severe appendicitis.	Death.	Died of perforation and septic peritonitis on fifth day of disease.
5	M.	40	Two previous attacks a year apart. Present attack not so severe as previous ones. The tenderness began to subside in 24 hours.	Recovery.	No subsequent attack in two years.
6	F.	35	Case of left-sided appendicitis which was not recognized.	Death.	Autopsy revealed a non-descent of the cæcum, with the appendix lying beneath the left rectus muscle. Death from septic peritonitis on fifth day.
7	M.	19	A mild case of endoappendicitis in which tenderness began to subside within 24 hours.	Recovery.	No subsequent attack at the end of three years.
8	M.	5	A well-marked attack which subsided rapidly; tenderness commenced to diminish in 22 hours. No previous attacks.	Recovery.	Not heard from since.
9	M.	20	Patient found by ambulance surgeon suffering from a typical attack. Refused operation.	Death.	Died within 48 hours from the commencement of the attack in the medical service at St. Mary's Hospital. Autopsy: appendix gangrenous and perforated; septic peritonitis; sero-pus and fæcal matter in peritoneal cavity.
10	M.	20	Mild attack, tenderness subsiding within 30 hours. No previous attack.	Recovery.	Suffered four relapses and operated upon in period of quiescence subsequently.
11	M.	18	The patient, a medical student, was suddenly seized with the usual symptoms. He diagnosticated appendicitis early in the case, but the family physician dissuaded him from this belief. Perforation occurred on tenth day.	Death.	The patient was prepared for operation, but his condition would not justify it.
12	M.	36	Well-marked attack in which all symptoms, including tenderness, began to subside at the end of 24 hours.	Recovery.	No further attacks during two and a half years.
13	F.	4	Early perforation and septic peritonitis. Operation refused.	Death.	Patient died a few hours after my visit.

CASES NOT OPERATED UPON.—CONCLUDED.

No.	Sex.	Age.	Course.	Result.	Remarks.
14	M.	40	Case of posterior perforation and septicæmia. Seen first by me on the twelfth day.	Death.	Septicæmia.
15	M.	14	Three previous attacks. Came to my office with a painful tumor in the right iliac region that had been present since an attack a month before.	Chronic relapsing case, seen in period of quiescence.	Patient was sent home with orders to remain quiet and send at once for his family physician. Case not heard from since.

SUMMARY.

Recoveries, 8 (acute attacks).

Subsequent History.

- Not since heard from 1
- Three years without another attack 2
- Two and a half years without another attack 2
- Suffered from one to four relapses and subsequently operated upon 3

Deaths, 6 cases.

Causes of and Periods at which Death Occurred.

- Perforation and septic peritonitis, second day 2
- " " " " fifth day 2
- " " " " tenth day 1
- Septicæmia, twelfth day 1

TABLE OF CASES OF DOUBTFUL DIAGNOSIS REVEALING CONDITIONS OTHER THAN APPENDICITIS.

Sex.	Age.	Symptoms.	Conditions Disclosed by the Operation.	Result.	Remarks.
M.	28	Sudden pain in right iliac region; vomiting; tender point in right iliac fossa; fæcal vomiting; tympanites; rapid pulse; surface of body blue and cold.	*Intestinal Obstruction.*—Seen on fifth day; laparotomy disclosed intestinal obstruction; a long diverticulum had wrapped itself around the ileum close to the cæcum; Diverticulum ligated and excised.	Recovery.	
M.	56	Previous pains in suprapubic region and irritable bladder; sudden and acute abdominal pain; vomiting and sensitiveness in right iliac region; sent to M. E. Hospital on third day.	*Secondary Sarcoma of the Appendix.*—The tip of the appendix had reached down into the pelvis and was attached to mass of sarcomatous tissue springing from iliac glands; appendix tip involved in the disease.	Death.	Autopsy confirmed the observations made at the time of the operation.
F.	30	Suddenly attacked by pain in right iliac region; tenderness; vomiting of green bile stained matter.	*Intestinal Obstruction* by band close to ileo-cæcal valve.	Recovery.	Operated upon in my service at the M. E. Hospital by my assistant, Dr. H. B. Delatour.
M.	23	Sudden attack; pain in right iliac region and beneath right rectus muscle; tenderness along dextral edge of right rectus muscle; previous good health.	*Sarcoma* involving entire cæcum and appendix, secondary to sarcoma of retroperitoneal glands.	Death.	
F.	35	Italian woman from whom no history could be obtained; sent into the hospital by a physician who had made a provisional diagnosis of appendicitis, upon the basis of statements made by the patient through an interpreter. Patient in collapse from some grave intraperitoneal lesion.	*Ruptured Pyosalpinx.*—An abdominal section, rapidly performed with the patient only partially anæsthetized, showed the peritoneal cavity filled with pus and serum; a large right-sided pyosalpinx had ruptured.	Death.	Autopsy confirmed observations made at the operation.
M.	50	Came home intoxicated the night before the attack and was put to bed; he awoke suffering from cramping, colicky pains; physician summoned, who found him extremely sensitive to pressure beneath the right rectus muscle, and peritonitis well under way. Removed to M. E. Hospital.	*Ruptured Gall-bladder.*—No diseased condition was discovered as a cause of the rupture; some injury was probably inflicted while he was intoxicated, although there was no external mark to show this; patient was in a bad condition at the time of the operation and took anæsthetic poorly.	Death.	Autopsy confirmed the conditions already stated.

TABLE OF CASES OF DOUBTFUL DIAGNOSIS REVEALING CONDITIONS OTHER THAN APPENDICITIS:—CONTINUED.

Sex.	Age.	Symptoms.	Conditions Disclosed by the Operation.	Result.	Remarks.
F.	56	Awakened suddenly in the night by severe colicky pains all over the abdomen; two hypodermic injections of ¼ gr. of morphia each were required to allay the pain; several doses of opium were afterwards given *per orem;* marked tenderness in right iliac fossa. Removed to St. Mary's Hospital.	Nothing found which would account for the symptoms; a thickened line along the edge of the broad ligament was thought to be carcinomatous infiltration, secondary to carcinoma, somewhere in genitalia or adnexa; the condition of patient under the anæsthetic did not admit of a prolonged search.	Death.	Death took place on the third day, quite unexpectedly. Autopsy revealed the cause of death as embolism of coronary artery; peritoneal cavity normal; all the vessels in the body atheromatous. The indurated edge of broad ligament was due to atheromatous deposits at that point.
F.	28	Attacked suddenly with pain in abdomen and in lumbar region, followed by pain in right iliac region; vomiting followed the onset of pain; fever and considerable constitutional disturbance; tenderness at outer edge of right rectus muscle at a point opposite anterior superior spine of ilium; tumor in right iliac region when examined by me on fourth day; chill upon third day.	*Dropsy of Gall-bladder.*—A right lateral laparotomy revealed a dropsy of the gall-bladder in which suppurative changes had begun; the gall-bladder was displaced downward; a portion of omentum had become adherent to its apex; upon incision of the distended gall-bladder a sero-mucous fluid escaped, followed by about a teaspoonful of pus; edges of incision in gall-bladder sutured to the abdominal wall.	Recovery.	Bile flowed from the opening in the gall-bladder on the fourth day after operation; this was preceded by the escape of a biliary calculus.
F.	60	Attacked by acute pain in epigastric region six weeks before admission to M. E. Hospital; this pain was followed by an attack of vomiting; more or less "dull pain" in right side ever since. Three days before admission symptoms recurred. Dr. Brinkman, her family physician, discovered a tumor at his first visit and immediately sent her to the hospital. The tumor was semi-elastic and tender; its lower border was on the omphalo-spinous line; temperature 104° F.; pulse 130; right rectus muscle rigid; no jaundice.	*Dropsy of Gall-bladder.*—Right lateral abdominal incision; distended gall-bladder with adherent omentum and considerable local peritonitis about gall-bladder; gall-bladder brought into the wound and opened; sero-mucous fluid, followed by pus evacuated; a gall-stone, the size of a robin's egg, found and removed; no bile present; walls of gall-bladder much thickened; gall-bladder sutured to abdominal wound and remainder of the latter closed.	Recovery.	Pure culture of *bacillus coli communis* obtained in the fluid examined.

TABLE OF CASES OF DOUBTFUL DIAGNOSIS REVEALING CONDITIONS OTHER THAN APPENDICITIS.—CONCLUDED.

Sex.	Age.	Symptoms.	Conditions Disclosed by the Operation.	Result.	Remarks.
M.	21	Two days before admission attacked with acute pain in the right iliac region, followed by vomiting; obstinate constipation and great prostration; vomiting persistent, but not fæcal; tenderness most marked at site of appendix; treatment, prior to admission, consisted in attempting to allay pain by the liberal use of opium.	*A Case of True Internal Hernia.*—Median laparotomy disclosed a hernia of a portion of the ileum into the fossa duodeno-jejunalis of Treves, the musculus suspensorius of Trietz acting as a band.	Death.	
F.	20	Patient suddenly attacked 24 hours previously with acute abdominal pains; suffered greatly all night; vomiting occurred the following morning; point tenderness in right iliac fossa well marked; admitted to St. Mary's Hospital; upon admission, anxious expression; knees drawn up; some tympanites; diffused sensitiveness; point tenderness in right iliac region; right rectus muscle tense; temperature 100.6° F.; pulse 116.	*Pelvic Hæmatocele.* — Exploratory abdominal section revealed a quantity of blood free in the peritoneal cavity. This had occurred from the surfaces of the ovaries, Fallopian tubes, broad ligaments and retro-uterine peritoneal surfaces. No coagula were present; no evidences of ectopic gestation. Commencing peritoneal inflammation in the right lateral half of the pelvis and right iliac fossa; peritoneal investment of the caput coli and termination of ileum markedly injected; peritoneal cavity cleansed and iodoform gauze drains introduced.	Recovery.	Convalescence complicated with iodoform toxic symptoms. Upon the day following the operation a rather copious menstrual discharge took place *per vias naturales*. Patient had been delivered of a stillborn child at term three months previously; she had not menstruated in the interim, save a slight vaginal discharge a few hours before the attack.

NOTE.—In the section upon the Pathological Anatomy of the Appendix Vermiformis which appeared in the April issue, the facts and deductions from which are exclusively the work of Professor Van Cott, the following errata are to be noted: On page 485, twenty lines from the bottom, "Hyperplasia" should read "Hypoplasial." On page 489, nine lines from the top, the word "not" should be omitted. On page 487, eight lines from the bottom "ulcerating" should read "ulcerative." On page 487, five lines from the bottom, "obtains" should read "obtain." On page 488, seven lines from the top, "causes" should read "factors." On page 489, first line, insert after "followed," "in some cases;" and omit "symptoms" after "temperature." On page 490, fourteen lines from the top, "plays" should read "play;" sixth line from bottom, same page, substitute "not" for "now."

SOME SURGICAL THOUGHTS ON APPENDICITIS FROM A CLINICAL STAND-POINT.[1]

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THE treatment of appendicitis by early operative interference, as advocated and practised during the past few years, appears to be passing through the same stages that have marked the progress of almost every important change proposed in the management of either medical or surgical diseases. Ridicule, sober judgment based on experience, and adoption or rejection constitute those three stages. The first is passed, and we are well advanced in the second stage; and the outcome will be a final agreement between physicians and surgeons that will be as satisfactory to both as it is desirable and important that it should be.

I have ventured in this short paper to present the results of my own observation, not with the hope or desire of adding anything new on a subject which is being so fully discussed and to which this Society has contributed so much of permanent value; but with the feeling that any deduction drawn from even a moderate experience may have their value in reaching conclusions which will receive general adoption. Novelty, therefore, is not claimed for any views here expressed; nor does it seem desirable; but if your own experience confirms them, it will be even more satisfactory than if they were new.

I have purposely avoided the relation of statistics, because I am sure I have seen harm result from being too much influenced by them in the treatment of the case; and the patient has been cheered by false hopes, or lulled into a feeling of comparative

[1] Read before the New York Surgical Society, February 14, 1894.

safety that his condition did not warrant. We are constantly hearing the statement made in consultation that fifty per cent. of cases of acute appendicitis recover without operation. This may be true on the first or second day of the disease; but on the third or fourth day, when the surgeon sees the case for the first time, it certainly is not true. A comparatively small proportion that have reached the third or fourth day, without decided improvement in the symptoms, recover without operative interference, in my experience. We are also told of cases in which, though suppuration occurred, spontaneous rupture took place into the intestine, and the patient recovered. Such a termination is certainly possible, and is not so infrequent as I formerly supposed. I have seen three such cases. The first case was that of a middle-aged German woman who had eaten freely of a raisin-soup, suppuration with spontaneous opening externally took place; raisin-seeds were discharged as well as some charcoal which I gave her to satisfy myself that there was communication still between the intestine and the abscess cavity. Rupture had already taken place when I first saw her. Healing followed, and the patient left the hospital apparently well. The second case was of a boy who had a sinus of a year's duration in the right groin, sometimes closed and sometimes open. Bone-disease was suspected, but not found; counter-opening made and kept open; an attack of peritonitis one year before I saw him, and semi-invalidism since. Several months after I operated upon him a fæcal concretion was discharged from the opening which I had made, and to my own mind explained the original attack of peritonitis (which was in reality appendicitis), and the trouble he had had for a year subsequently. The sinus healed promptly, and has given him no inconvenience since. The third case I saw only after death. The patient, a medical man, with a history of three or four attacks of pain in the region of the appendix, with fever lasting a week or ten days, at intervals of a few months. The last and fatal attack insidious, the patient being up and about on the day before he died with dysenteric symptoms. I was invited to be present at the autopsy, the case being considered one of obscure abdominal disease. The largest collection of pus that I have ever seen in a similar case was found, and it had burrowed

down behind the rectum, giving rise to tenesmus and bloody discharges. The abscess had perforated the head of the colon, apparently from without inward, giving rise to an appearance just the reverse of what we see in a perforating typhoid ulcer, the opening through the peritoneal coat being very much larger than that in the mucous coat. The appendix was to all appearances healthy. It was not, however, subjected to microscopic examination. But while such cases as these do occur, the termination is nothing more than a possibility. It is not probable, and resulted, in these cases, once in a cure, possibly permanent; once in a year of semi-invalidism, and once in death. We need not and would surely not take into our consideration such chances in our advice to physician or patient. Again, such statistics as are at present at our command are too general to be of any value in an individual case. And in not a few instances they are worse than useless, for without surgical aid, the patient who has about an even chance for recovery or death must wait for his verdict until he is either a convalescent or a corpse. If the time ever comes when we shall be able to foretell results by a symptom or a set of symptoms, our figures will be helpful; but that time has not yet arrived, and I doubt whether we shall ever be able to predict the outcome of an attack with any greater precision than at present. I have not, in my own experience, been able to rely upon any symptoms in the early stage to indicate that resolution or suppuration would be the more likely termination in a particular case. And in quoting such statistics as we have at present, we fail to bring before the patient the possibilities and even probabilities of recurrence and its dangers.

Another thought that I would like to present for consideration relates to the position that physicians very commonly take regarding the nature of appendicitis. It is by many in the profession looked upon as a medical disease, unless or until it has reached an operative stage, when it becomes surgical. The physician is even on record as saying to the surgeon, "When I want you I'll let you know, and I want you to come ready to operate." This puts the surgeon in a position in relation to the case that he will not shirk, indeed, but one that he does not desire. He would like to decide whether he is to operate, and

when; if the responsibility of the treatment comes on him, as it must if he does the operation. I think a good deal of importance should be attached to combating this claim made by many physicians.

The surgical nature of appendicitis would seem to be proved by the suppurative process, by the ulceration and gangrene, and general septic inflammation of the peritoneum, all of which are more or less common in half the cases, and possibly in every case; and still more by the fact that the diagnosis is largely chirurgical,—is made so largely by the hand; and, finally, by the treatment which is in so large a percentage of cases operative. Nor does the fact that many cases have recovered without operation take the disease out of the list of surgical affections. Another reason for considering the disease a surgical one has already been hinted at above. The end we have in view is not to be reached by answering the question, "How many lives can we save?" but "What, all things considered, is the very best that we can advise and do?" And to do our very best, it would seem reasonable that the surgeon should see the case at the earliest possible moment, and not be called upon so late that the best he can do is after all but second best. If our experiences, medical and surgical, are to yield the results for which we hope, the surgeon and physician must start on the same basis, and this manifestly is not the case if the surgeon is brought into contact with his patient two or three days later than the physician. Already in consultations a comparison is being instituted between the medical and operative treatment of appendicitis on the above basis. We must decline to accept the inferences drawn from such an unfair comparison. Let us adhere to the position taken in our most modern surgical writings, that appendicitis is a surgical disease from the beginning; our comparisons must be made on the basis of connection with the case from the start. And any one who assumes the responsibility of treatment ought to feel that he is doing surgical work just as he would in undertaking the treatment of a fracture. Surgery has nothing to regret in its present therapeutic attitude towards appendicitis; but if we shall be able to see our operative cases earlier, I feel confident we shall have even better success than we have had already.

A fallacy, but one that ought to be quickly dispelled after operating on a few cases of appendicitis, is expressed in speaking of the first day that the patient complains of pain as the first day of the disease. With about as much propriety might we speak of that as the first day of the disease when a typhoid ulcer perforates the intestine. Here an ulceration, always present in typhoid, but not to be located by the touch or pressure of the finger, has been steadily eating its way into the intestinal wall for two, three, or four weeks, when suddenly, and often without any symptoms to indicate its development, perforation takes place and the patient is in collapse. The comparison, I think, is a fair one, and the local conditions often the same. What we recognize, I believe, in appendicitis is peritonitis, and not the ulceration in the mucous membrane, which has been going on for a longer or shorter time; and instead of seeing the case on its first day, we are really seeing it in the majority of acute cases near its last day. This thought has made me much less willing to temporize with these patients than formerly. How many days may have been occupied in the ulcerative process we have no means of judging, as we have, approximately, in the perforation of a typhoid ulcer. The changes found in the appendix removed very early can hardly be explained with disease of only a day or two to account for them; and in those cases of sudden perforation without previous complaint, the inflammatory process must have existed for some time before the accident occurred.

The idea is still prevalent that the great danger from an acute attack of appendicitis lies in the rupture of the abscess wall, followed by a general septic peritonitis; but one who treats a case on this basis is doing so at great risk to his patient. That a septic peritonitis is the greatest danger we have to fear is quite true; but that it always, or I think I may say in the majority of cases, occurs in this way my own experience would lead me to doubt. I have been rather disposed to attribute the general inflammation to an extension from its original seat in or about the appendix without the formation of a limiting wall of exudation, or to an infection through the lymphatics. In a few cases without rupture of the appendix, and with no local collection of pus, there has been found already at the time of the

operation a general septic peritonitis. In one case a septic peritonitis was present with a well-defined abscess cavity, unruptured as far as I could discover. In many cases it is difficult to say in which of these ways the original inflammation gave rise to the general inflammation.

With regard to the dreaded foreign body, of which we formerly heard so much as a cause of appendicitis, I may say that, with the exception of the case reported of spontaneous opening with discharge of raisin-seeds, I have never found any foreign body of that nature. I have been in doubt as to the causal relation of fæcal concretions to the inflammatory trouble. Blows and falls, strains, exposure to cold, overeating, and constipation have been the alleged cause in a number of instances, and have had a correspondence in time with the onset of the disease; but what, if any, causal relation any one of them has borne to the attack of inflammation has been uncertain in my own mind.

An ulcerative process has been the starting-point in my own cases, rather than a gangrenous one. In the cases seen late a destructive inflammation has produced such ravages as to render it impossible to determine the character of the initial lesion. With the exception of these cases the typical picture has been of more or less extensive ulceration of the mucous coat, with or without fæcal concretions, the appendix swollen, its walls much thickened, constricted often on its mucous side, bright-red in color in the early operated cases, and dark, and often twisted spirally on itself in the cases subjected to a later operation. The gangrene has seemed to me to be usually due to twisting of the mesentery, and secondary to the ulceration, although of this I do not feel at all certain. No cases have presented a simple catarrhal inflammation.

Impressed with the importance of the views thus far expressed, I have felt the necessity for an early and exact diagnosis. To make an exact diagnosis late in the disease is easy, and to make an early probable diagnosis is not difficult, but to make it at the same time early and exact is in some cases impossible, without the aid of an exploratory incision. The abdominal cavity is proverbially a field of difficult diagnosis, and the reasons

are not far to seek; they are found in the great variety of structure, multiplicity of viscera, and their mobility and varying conditions within physiological limits, and to the many and varied pathological processes that are developed here. And when the field is still further narrowed to a consideration of the region of the appendix, we are dealing with an organ that is deep-seated, small in size, and with no functional action to be disturbed, and yield symptoms when disease attacks it. In the female the ovaries and tubes sometimes make the diagnosis, more difficult than in the male. Yet, with all these obstacles, both in the whole abdominal cavity and in the region of the appendix, I will venture the assertion that the mistakes in diagnosis made by the surgeon are not more numerous than those made by the physician or gynæcologist. The few mistakes that the surgeon makes in his diagnosis are exaggerated by quoting the histories of patients on whom operations have been performed, and the appendix found healthy. These patients count for much more than they are worth numerically; they are fairly offset by the fatal cases of unrecognized appendicitis not operated upon, and unrecognized, partly because they were not given the benefit of an exploratory incision.

The symptom on which I have relied, and the one without which I confess myself unable to make a diagnosis, is the tenderness,—the "McBurney point,"—never absent in my own personal experience, and never thus far making me mistaken in my diagnosis. The time will doubtless come when I shall be obliged to record an error; but thus far this symptom has not failed me. The other symptoms have, many of them, been such as are associated with other abdominal disease; but some of great value in confirming me in the diagnosis, such as the sudden onset of the disease, the tension of the muscles, the ill-defined tumor, constipation, the facial expression, the rigid position of the body maintained in moving. The other symptoms I have learned to depend on less, but recognize their value, such symptoms as nausea and vomiting, pain, the temperature and pulse, chills and sweating, and the evidences obtained by rectal examination. The value of these symptoms, however, has depended very much on the stage of the disease. Those cases that have been seen very early, and

have been marked by the sudden onset of severe pain with even moderate fever and tenderness at the McBurney point, and usually vomiting, have proved to be cases of appendicitis, whatever else they may have simulated before the operation. Later on, the abdominal wall has been rigid, but not so under an anæsthetic; the tumor present was easily felt with the patient anæsthetized, the pulse becoming hard and irritable. Rectal examination I have not made of late, because it has not helped me to a diagnosis where I have made it. The temperature, as indicated by the thermometer, has been of almost no value. The diagnosis, then, has been in many cases easily made, in most cases not difficult, even without incision, and in the few uncertain cases I have not hesitated to recommend and employ the exploratory cut to clear up the diagnosis, having less anxiety from the slight dangers of the incision than from the possible dangers of the appendicitis. The surgeon claims for exploratory laparotomy the same usefulness that the physician claims for his exploratory puncture of the thoracic cavity,—namely, to confirm or disprove a probable diagnosis, and such, in his doubtful cases, does not hesitate to make the incision or the puncture. The puncture in the abdominal cases has been discarded, partly on account of its danger, but more on account of the fact that the surgeon desires to see his patient before the exploratory puncture would be of any use to him. He wants to see the inflamed appendix, and not simply evacuate a perityphlitic abscess.

As to the treatment, I may say that, in those cases that I have seen lately, when a well-marked abscess-cavity has been present, I have been satisfied to evacuate the pus, wash out and pack the cavity with iodoform gauze, without making much search for the appendix. Sometimes I have removed the sloughed appendix with forceps, and also small fæcal concretions. The ultimate result in these cases, so far as I know them, has been a firm scar without hernia. The final result in many cases I do not know. One case so treated developed symptoms of appendicitis about a year after the operation. Resolution took place, but his subsequent condition I cannot state. The cases that I have been able to see or to treat very early have had a catgut or silk ligature applied without invasion of the stump,

the abdominal wound stitched up, and primary union has taken place. The large proportion of cases operated upon have been seen from the third to the fifth or sixth day. This has seemed to me the most undesirable time to operate, on account of the liability to cause the very thing we operate to avoid,—namely, infection of the peritoneum, and, exercising all the care possible to wall off the abscess-cavity from the general abdominal cavity, the pus will often pass out of our reach before we can remove it all, and the danger of infection is increased when we remove the appendix, and in doing so break up adhesions that have kept the pus circumscribed. In this third class of cases I have used a catgut or silk ligature to the base of the appendix, and should imagine that it would be a difficult thing to invert the stump on account of the thickened condition of its walls, a condition which has not been present in the operations very early. I am treating now my first case of fæcal fistula following the removal of the appendix, the patient being a very stout young man in apparently perfect health, operated upon on the fourth day from the first symptoms. The abscess-cavity contained unusually dark-colored and offensive pus and a fæcal concretion. His condition, except for the fistula, is satisfactory now, one week after the operation. In no other case have I met with this unfortunate accident. In cases operated on during this stage I have had some difficulty, without manipulating the intestines more than seemed wise, to recognize the colon. I have depended less on the appearance to the eye than on the thickness of the walls under the finger, the additional thickness furnished by the longitudinal bands, and by the shortness of the mesentery that holds the colon back when traction was made upon it. The tags of fatty tissue have not always been recognizable to the eye or the touch. The cavities have been packed with iodoform gauze, and when possible left undisturbed for five days.

The cases of septic peritonitis have with one exception been diagnosticated before operation by the usual symptoms. In this case, seen and operated on on the third day from the onset, the abdomen was sunken instead of being distended, and, in spite of thorough evacuation, irrigation, and drainage, terminated fatally, as all my other cases of this kind have done.

Nearly all the cases operated upon have been suffering from their first attack. The rest have had one previous attack, none more than one.

Of the cases of recurrence without operation, I have seen and been able to keep track of six. One had three attacks at intervals of a year, the last one fifteen years ago. Two have been free from attack for four years, having had three attacks previously; one five attacks in about three years and a half, the last one very mild, two years ago; the other two four or five attacks in less than a year, the last attack one year and one year and a half ago respectively. In the last four cases I have advised and rather urged operation, but after consideration they have declined to be operated upon, as they say, "while they are well."

Without going further into details of treatment, I may state what conclusions my experience has forced me to draw with reference to the subject of appendicitis:

(1) Appendicitis is a surgical disease from its beginning.

(2) Its diagnosis is usually not difficult.

(3) In doubtful cases exploratory laparotomy is justifiable.

(4) Appendicectomy, all things considered, offers the best chance, immediate and remote, for the patient.

(5) The operation should be done at the earliest possible moment.

Lack of experience in the operative treatment of recurrent appendicitis makes it impossible for me, with the limitations I have set for myself in this paper, to draw any conclusions; but I feel quite certain that an attack of recurrent appendicitis will be as rare in a patient who has had his appendix removed early in the first attack as a second attack of acute articular rheumatism in a joint of an amputated limb.

A NEW METHOD OF CLOSING THE CANAL IN RADICAL OPERATION FOR INGUINAL HERNIA.

By HARALD GRAFF, M.D.,

OF SAINT PAUL,

ATTENDING SURGEON TO THE BETHESDA HOSPITAL.

AN undisturbed aseptic course given, as a matter of course, the two most important conditions for securing a permanent result after radical operation for hernia are—first, the complete elimination of the peritoneal infundibulum (funnel), of which no trace must be left in the canal, and, second, the firmest union of the rent in the fibrous layers of the abdominal wall that can be obtained.

A proper operation requires the hernial canal to be laid open throughout its whole length up to the level of the internal ring, and the neck of the sac and the peritoneum beyond the internal ring to be completely loosened and dissected free for a certain distance beyond. Thereafter the walls of the canal must be accurately sutured and brought in the closest possible apposition.

If these conditions are all complied with, and the person otherwise is healthy, we will secure a successful and lasting result. Here we have only to deal with the closing up of the canal.

Macewen, who does not—or at least originally did not—split open the canal, uses for this purpose a quilt suture, which takes hold parallel to the direction of the canal, and which in the half of its course is buried in the tissues. In order to facilitate parallelization, we will consider it as if he did really cut the canal, and thus got two flaps, which he apposes in everting them. Lucas-Championnière uses a similar quilt suture, also taking hold parallel to the direction of the canal, but with this difference,

that he carries it clear through the fibrous tissues on both sides, that he reinforces it with two ordinary suturæ nodosæ, and that he superposes the flaps, the internal in front of the external. The cuts below (Figs. 1 to 9) will show their methods of suturing and the kind of apposition which they respectively obtain.

Then we have Bassini, who removes the spermatic cord from

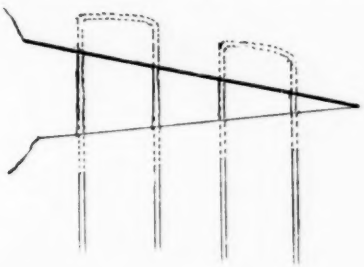

FIG. 1.—Macewen's suture placed.

its natural layer, arranges for it a new outlet between the muscular and aponeurotic sheets of the abdominal wall, and thereafter completely closes the whole original canal. As I consider his proceeding unnecessary and too much *contra naturam* to be good surgery, I shall not further take his method into consideration.

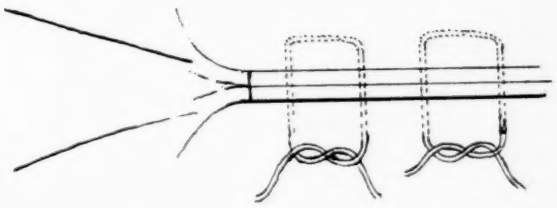

FIG. 2.—Macewen's suture tied.

In January, 1892, I had the privilege of being present at the Roosevelt Hospital in New York at an operation for radical cure of a large inguinal hernia on the left side, performed by Dr. McBurney. The contents of the sac were found to be part of the sigmoid flexure, and when the doctor, on account of this unfavorable circumstance, expressed his doubt about being able to secure a permanent result, I suggested to him a method of

suturing the fibrous layers, which I thought would give the greatest possible strength to the closure of the abdominal rent. The distinguished surgeon kindly approved of the suggestion, and made use of the suture.

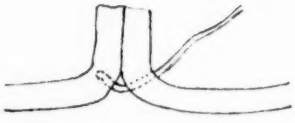

FIG. 3.—Apposition obtained by Macewen's suture.

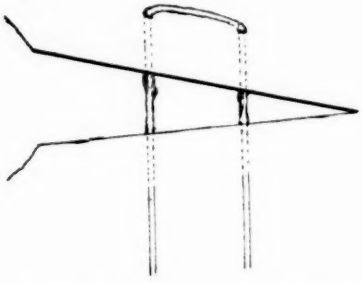

FIG. 4.—Lucas-Championnière's suture placed.

Since then I have employed this suture in a number of operations for the radical cure of hernia, and as it seems to me rational, both from an anatomical and from a technical point of

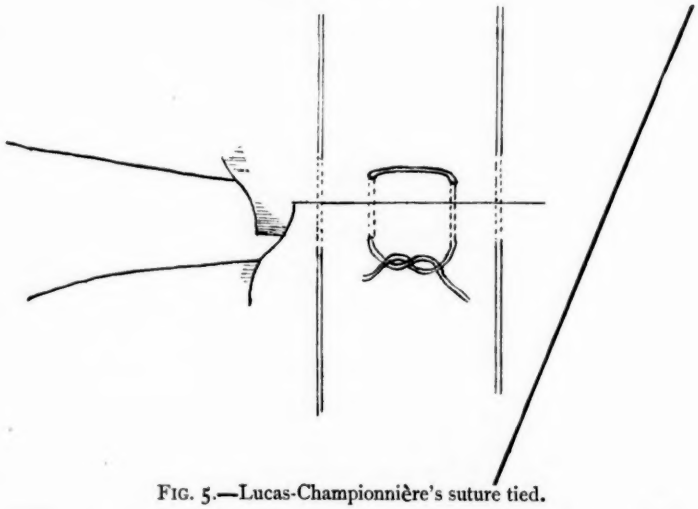

FIG. 5.—Lucas-Championnière's suture tied.

view, and superior in some respects to the methods of Macewen and Lucas-Championnière,—with which it most naturally can be compared,—I feel now justified in publishing it. It is, though,

very simple, and really nothing but an adaptation of Lembert's intestinal suture for this particular purpose.

It must be borne in mind that the predominant direction of

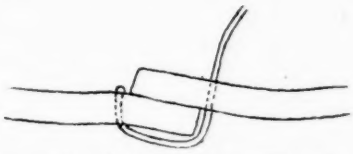

FIG. 6.—The apposition obtained by Lucas-Championnière's suture.

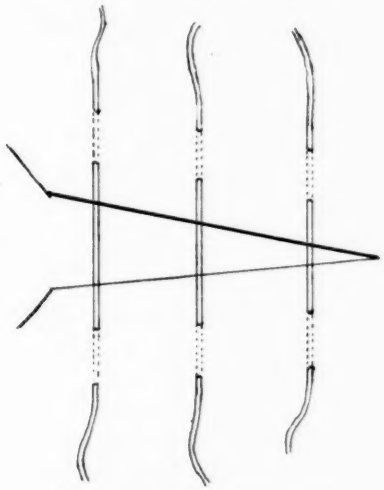

FIG. 7.—Author's suture placed.

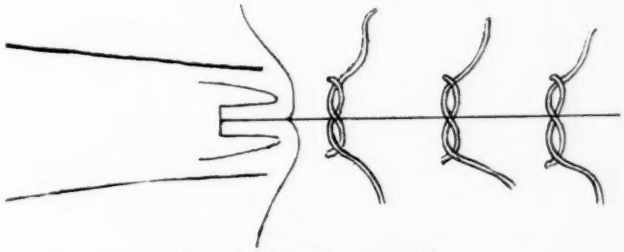

FIG. 8.—Author's suture tied.

the strongest fibres on both sides of the inguinal canal is parallel to the direction of this canal. Consequently, a suture, in order to take the strongest possible hold on these fibres, should be

inserted vertically to their direction and *not parallel*, as is the case with both Macewen's and Lucas-Championnière's sutures. Furthermore, I do not evert or superpose my flaps, but I invert them. Thereby I bring broad fibrous surfaces in contact with each other. The cuts annexed (Figs. 7 to 9) will sufficiently explain the way I introduce my sutures and the apposition I obtain.

Firmly believing, as I do, that good and successful surgery depends upon a close attention to details, I feel justified in sending these lines to the ANNALS.

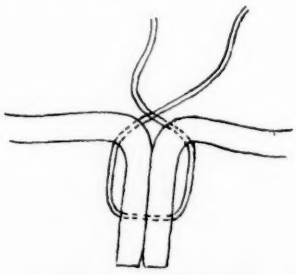

FIG. 9.—Apposition obtained by author's suture.

I use in preference Macewen's double-curved, dull-pointed needles with handles, but ordinary needles may be used just as well. I prefer medium-sized silk to catgut. Aseptic, it cannot cause any harm, and if not absorbed in course of time, it will remain indefinitely without ever giving rise to trouble.

My cases are, of course, too recent and too few to furnish statistical material of any value.

NOTE ON THE VALUE OF MACERATION IN ETHER AND IN ETHER-SOLUTION OF CORROSIVE SUBLIMATE FOR THE STERILIZATION OF CATGUT.

By FREDERICK C. HOLDEN, M.D.,

OF BROOKLYN,

RESIDENT OBSTETRICIAN, ST. MARY'S MATERNITY HOSPITAL.

PERHAPS there is no other article used in the consummation of aseptic and antiseptic operations of the present time upon which have been bestowed more time, care, and expense than the catgut for ligatures and sutures. In spite of its inherent dangers, it has not been displaced by other materials. Among recent methods for its sterilization, the most promising has been boiling in alcohol.[1] During a term as interne at St. Mary's General Hospital in Brooklyn, where this method was exclusively used, I was often impressed with the following marked disadvantages in the preparation of catgut by this method. The alcohol used must be absolute, or nearly so, and this can only be obtained for a certainty by securing it in the original package from some reliable manufacturer, and it is almost impossible to keep it absolute on account of its hygroscopic property. The necessity for a special apparatus is itself an objection. But the inherent danger of the method is its greatest drawback. I have several times seen an explosion occur even in this apparatus;

[1] New York Medical Record, August 16, 1890. And in the same connection appears Dr. Charles N. Dowd's article, in which he very accurately describes an apparatus for use where this method is employed (New York Medical Record, December 3, 1893). In the same Journal, Dr. James O. Wilson refers to a more simple contrivance for those who do not possess the expensive and complicated apparatus of Dr. Dowd.

and it is a great disadvantage that some one must be always detailed to watch the process the whole time that the alcohol is boiling. There would have surely been serious damage done in the instances to which I have referred had not a nurse been near at hand to extinguish the flames. I have seen very poor practical results from this method, such as weak gut, when probably an inferior grade of alcohol has been unwittingly used. This must of necessity make it weak as the catgut absorbs the water. When once the catgut, thus prepared, has been removed from the original tubes in which it has been boiled, or has been in any other way exposed to possible infection, it is necessary that this painstaking method be repeated for another hour with the precautions above stated. Repeated boilings have a tendency to weaken the gut unless the same care to use absolute alcohol be adhered to.

It is my purpose to refer in detail to a method which possesses the prime advantage,—*i.e.*, simplicity,—no watching, no care, and no special apparatus,—and which is backed by results par excellence, as has been amply demonstrated by laboratory test, and a large clinical observation. I refer to that of Dr. John C. Schapps,[1] of this city, and subsequently modified. The commercial catgut in coils is placed in a wide-mouthed bottle with well-fitted glass stopper (what is known as a six-ounce, German XX salt-mouth is an economical size, as the internal diameter just permits the ordinary coil to lie flat) and completely immersed in stronger ether. The object of this step, the extraction of the fatty and other organic matter which would protect the microbes from the action of ordinary germicidal solutions, seems to be accomplished in forty-eight hours, but the catgut may be stored in ether for an unlimited time. When taken out it looks and feels remarkably clean, while the ether is more or less discolored and has acquired a distinctly animal odor. It is next wound on glass spools and placed in a small bottle containing an ethereal solution of mercuric bichloride one to one thousand, and there allowed to remain until used. According to the report given below it is sterile in five minutes.

Catgut is itself a devitalized animal tissue, and as ligature devitalizes, the objections to germicides do not apply as in the

[1] New York Medical Record of July 13, 1889.

case of living tissues, but the addition of a small amount of chemical germicide may be regarded as conservative. In other words, devitalized animal tissue is safer with than without the protection of a small amount of germicide.

To determine the effects of the ethereal solution and those of boiling and keeping in alcohol upon the tensile strength of the catgut, the following procedure was adopted: Five pieces were numbered. One, two, three, four, five, and each divided into thirds. One-third of each was left raw; one-third treated by boiling for one hour in 99.8 per cent. alcohol and left in the alcohol; the remaining third was placed in a one to one thousand

TESTS OF RAW CATGUT.

SPECIMENS.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Diameter	.0208″	.0197″	.021″	.0221″	.0223″
Breaking Load	11.375 lbs.	16 lbs.	13 lbs.	14.5 lbs.	18.27 lbs.
Tensile Strength	33,475 lbs.	52,493 lbs.	37,528 lbs.	37,799 lbs.	46,774 lbs.

TESTS OF CATGUT BOILED AND SOAKED IN 99.8 PER CENT. ALCOHOL.

SPECIMENS.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Diameter	.0208″	.0197″	.021″	.0221″	.0223″
Breaking Load	13.9 lbs.	15.7 lbs.	13.78 lbs.	11.62 lbs.	20.19 lbs.
Tensile Strength	40,906 lbs.	51,509 lbs.	39,780 lbs.	30,291 lbs.	51,689 lbs.

TESTS OF CATGUT SOAKED IN ETHER AND BICHLORIDE OF MERCURY.

SPECIMENS.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Diameter	.0208″	.0197″	.021″	.0221″	.0223″
Breaking Load	12.22 lbs.	17.43 lbs.	11.72 lbs.	19.22 lbs.	15.59 lbs.
Tensile Strength	35,962 lbs.	57,185 lbs.	33,833 lbs.	26,642 lbs.	39,912 lbs.

solution of bichloride of mercury in commercial ether. At the end of one month tests were made at the Pratt Institute in this city to determine the tensile strength of each piece, each being divided, and so tested twice. In all thirty tests were made.

The tensile strength is the breaking strain per square inch

of section. The average of the raw catgut was 41,613.8 pounds; that of the alcohol boiled catgut 41,835 pounds; that of that treated with bichloride and ether 38,626.8 pounds. In other words, the catgut boiled in alcohol would seem to have acquired an increase of 0.5 per cent., and that treated with bichloride and ether a decrease of 7.4 per cent. The catgut in this instance was inadvertently prepared in commercial sulphuric ether, and its tensile strength, it is just to assume, was thus markedly lessened. If this diminution were constant, it would be so slight as to be practically of no account, but an examination of the table shows that the raw material has about as great a variation as this, and that the piece showing the greatest strength was one of those treated by ether and bichloride. Dr. Schapps has some that has been in solution for about three years, and it shows no perceptible diminution in strength. The inference is a fair one that the use of this method does not impair the strength of the catgut, and this inference has been abundantly borne out by clinical experience.

Dr. Louis C. Ager, assistant, Department of Bacteriology, Hoagland Laboratory, has, in compliance with my request, kindly made the bacteriological tests and reports as follows:

A number of pieces of catgut suture about one inch and a half long were sterilized in an Arnold sterilizer for half an hour. The catgut was medium size and came from the operating room of St. Mary's Hospital. These pieces were then soaked in an old sporulating culture of bacillus anthracis for twenty-four hours. One of them was dropped into a tube of sterile beef-tea and the others were put into a solution of bichloride of mercury, gr. ¼, to ether sulph., oz. ½,—(*i.e.*, 1 : 960). They were next removed at intervals of 5, 10, 20, 30, and 60 minutes, washed in sterile water to remove the bichloride and dropped into tubes of sterile beef-tea. After sixty hours in the incubator there was a prolific growth in the control tube, but the others remained sterile. In order to ascertain whether enough bichloride had been carried over to inhibit the growth of live germs, all the tubes were inoculated with anthrax. After forty-eight hours in the incubator there was a growth in each tube. This experiment is, on the whole, satisfactory. It seems to show that five minutes in an ether solution of bichloride of mercury, 1 : 1000,

is sufficient to sterilize catgut. Still, there are certain possibilities of error to be considered. The growth after the second inoculation was not as prolific as was to be expected, showing that a certain amount of bichloride was present. As Gefferts has shown that even 1 : 2,000,000 bichloride solution will prevent the development of anthrax spores, the vitality of which has been lowered by a strong solution, it is not impossible that there were living spores in the catgut. But, if there was a sufficient deposit of bichloride of mercury about them to prevent their development, they need not be considered.

A somewhat extensive use of catgut thus prepared has served to verify clinically these findings. In no case of operation in healthy tissues has suppuration occurred. The absence of stitch abscesses when the catgut is used is evidence to prove that the amount of mercuric bichloride incorporated into it is not enough to interfere with the vitality of the tissues with which it comes in contact, and if there are any germs present they do not declare themselves sufficiently to mar the gratifying effect of the method. The catgut so prepared ties with a good, firm knot.

Some of the most prominent of the advantages of this method are: When the catgut becomes in any way infected, simple replacement in the solution renders it soon again ready for use. Ether cannot be diluted with water, and if it evaporates, a supply is usually at hand. Should the surgeon at any time, in case of emergency, find himself without a supply of reliable catgut, what could be easier than simply to immerse the raw catgut in the ethereal bichloride solution, which could be done while other preparations for the operation were being executed? This has been shown by the foregoing experiments to be sufficient without the preliminary washing in ether. The catgut does not look nor feel as clean, however. The precautions to be taken when this plan is in vogue are that the catgut, when taken out of the solution and not used, is not in any way brought in contact with aqueous solutions as it will become softened, and when again replaced in the ethereal solution does not regain its former strength. If the ether evaporates, it, and not a solution of bichloride, should be added. As the commercial sulphuric ether

contains alcohol, it is essential that stronger ether be used. Otherwise, as the ether evaporates the alcohol will absorb water from the air. When the glass stoppers do not fit accurately, as is frequently the case, they may be refitted at a nominal expense. It is also a simple but valuable precaution, whenever volatile substances are to be enclosed, to put with a small file corresponding marks upon each bottle and its stopper. When the ether has become so contaminated as to leave a grease-spot where it touches the sides of the bottle, it must be replaced by fresh. It is available for a first bath, fresh ether being used for a second.

Catgut prepared by means of commercial sulphuric ether, when exposed to the air, is moist, shiny, and soft, but when stronger ether is used, it remains stiff and hard.

It soon becomes pliable by absorption of moisture, but clinical experience demonstrates that it does not break down too soon.

I know of no reason why the same treatment may not be used for other styles of suture material, as silk-worm gut.

A CASE OF PRIMARY TUBERCULOSIS OF THE LAMINÆ AND SPINOUS PROCESSES OF THE VERTEBRAL COLUMN.[1]

By JOHN B. ROBERTS, M.D.,

OF PHILADELPHIA,

PROFESSOR OF SURGERY IN THE WOMAN'S MEDICAL COLLEGE OF PENNSYLVANIA; SURGEON TO THE METHODIST AND THE JEWISH HOSPITALS.

THIS case seems worthy of record because of the unusual situation of the tuberculous process, the diagnosis of which is substantiated not only by the clinical expression, but by bacteriological investigation. Even before an expert examination of the specimen was made, I had no doubt of the tuberculous character of the lesion until I recently read the statement of Bradford and Lovett, that "the transverse, articular, or spinous processes are rarely affected secondarily, and so far as is known never primarily, their structure of hard bone apparently protecting them from tubercular invasion."[2]

The child, a girl of ten or twelve years, a native of Russia, was unable to give a very clear account of herself because of her ignorance of German and English. She was admitted to the Jewish Hospital in July, 1892, with the statement that three months previously she had fallen down two steps, and had subsequently experienced pain in the side and the abdomen, for which she had walked to the Pennsylvania Hospital for treatment. She was admitted to that institution. The pain in the abdomen gradually left her, but she subsequently suffered from increasing pain in the legs. Two weeks later she had fever on a certain day, and on the following day was paralyzed from the hips downward. There was incontinence of urine and fæces, and bed-sores soon developed upon the hips. There

[1] Read before the Orthopædic Section of the College of Physicians of Philadelphia, January 19, 1894.

[2] Orthopædic Surgery, p. 3.

was loss of sensation as well as motion below the brim of the pelvis. There was slight scoliosis in the dorsal region, with tenderness on pressure. No history of scarlet fever or diphtheria was obtained, and, according to the statements made, the patient had been well up to the time of injury. At the time of admission to the Jewish Hospital the child's appetite was good, the tongue slightly coated, and the bowels regular. The urine had an alkaline reaction, contained no albumen, and no sugar. These notes I obtained from Dr. J. C. Knipe, the resident physician of the Jewish Hospital.

After the death of the patient I applied to the Pennsylvania Hospital for an account of the condition of the girl while in the wards of that institution. The notes of the physician who had charge of her state that the child was brought in by the police patrol with the history of having been overcome with the heat. The patient was conscious and said that she had been feeling well until about three hours before admission, when she fainted while working in a hot room. Her temperature was $105\frac{1}{5}°$ F. in the rectum, 99° F. in the axilla, and her pulse 104, respiration 30. The following day her condition appeared normal, and she was discharged, the pulse being 80, the respiration 24, temperature $98\frac{1}{5}°$ F. It will be seen, therefore, that no marked disease existed at the time she was admitted to the Pennsylvania Hospital. The discrepancy as to the character of the fall is probably due to the difficulty in obtaining an accurate history from the patient.

She remained under treatment in the Jewish Hospital, being given potassium iodide and tonics. Electricity was also employed. Her temperature was very variable, and the complaint of pain in the feet and back was almost constant. Sometimes the pain was very severe, and accompanied by nausea and vomiting; and elevation of temperature amounting to two or three degrees occurred.

When I first saw her, in October, 1893, I found a sickly-looking child, with bad bed-sores partially cicatrized, and a marked prominence in the dorsal region, which did not look like the ordinary kyphosis of Pott's disease, because the bulging was more marked on each side of the spinous processes than over them. The testimony of the nurses and doctors seemed to be that there was little or no deformity in this region when the child was admitted. I presume, therefore, that the statement in the notes is correct; that there was appearance of lateral deformity or scoliosis only when she was admitted. I ordered a plaster-of-Paris jacket to be applied, and that,

if possible, extension and counter-extension in bed should be made. The latter seemed impracticable, but the jacket was worn for about ten days. The deformity in the back increased, and I thought I obtained a sense of indistinct fluctuation. The bed-sores, under careful nursing, though they were very deep and extensive, became healed. The patient presented marked swelling about the middle of the dorsal region of the back. It was evident that this was no ordinary kyphosis, because the swelling was most marked on each side of the median line, and there was a hollow over the spinous processes of the vertebræ. The tumefaction on the right side of the spinous processes was more marked than that on the left, and the two were divided by a groove due to the normal attachment of the integument to the apices of the vertebral spines. This swelling had been gradually increasing for five or six weeks. It gave an elastic sensation on palpation, and showed evidences of being a tubercular abscess.

I believed that the case was one of tuberculosis of the middle dorsal region attacking the laminæ of the vertebra and not the bodies, and that there was probably an abscess within the spinal canal causing the paraplegia present, which had developed early in the history of the case. The fact that no deformity, except some little deviation (lateral (?)) of the spine, was noticed when the child came into the hospital seemed to verify this conclusion.

After watching the case for six weeks I concluded to make an exploratory incision with preparations for doing laminectomy. My friend, Dr. H. Augustus Wilson, agreed with me in the diagnosis and propriety of operative interference. A one-inch incision was made over the more prominent portion of the swelling,—namely, to the right of the median line, and when the skin and fascia were divided, an elastic swelling similar to a cystic tumor presented itself. This I believed to be an abscess-sac, and I had a basin brought to receive the fluid which would escape upon puncture. I incised the distended deep fascia and found it to consist of broken-down cheesy material and a considerable quantity of fluid blood. As I put my finger into the opening so made, I found some bone fragments, which were, however, very small. I bored my finger through the soft tissues to a considerable extent. There was no puriform fluid in the cavity, though there was some disintegrated bony material. The blood was dark in color and seemed to come from an active venous hæmorrhage. I could stop the bleeding by pushing my finger into the bottom of the wound close to the laminæ. In the endeavor to control this hæmor-

rhage I enlarged the wound, while I held my finger upon the bleeding-point. When the parts were laid open there was general oozing, but no special vessels were found that needed ligation.

The cavity was then packed with gauze, and an incision from three to four inches long was made on the other side of the spinal column into the second tumor. This was connected with the first incision by a transverse cut across the median line. This enabled me to raise a large rectangular flap, and exposed thoroughly the spinal column and the swelling on both sides. The swelling on the left side consisted of a mass of tissue infiltrated with tuberculous deposit. As this was hard, it was quite different from the soft, moderately fluctuating tumor on the right side, which had been opened first. Bleeding was quite diffuse from the vessels divided on raising the flap. The patient probably lost, through both incisions and from the hæmatocele on the right side, from four to five ounces of blood. The surfaces were pressed with sponges, but no vessels needed to be tied.

The laminæ were easily cut with an ordinary scalpel, except at the left side, where at the upper portion of the osseous incision a chisel was used. This, however, required very little force to push it through the soft bone. Two, or perhaps only one, vertebral arches were thus divided. The laminæ on the right side of the spinous process in the same region had previously been divided. I had at first determined the position of the first solid spine and arch below, and of the first solid spine and arch above, before I cut into the softened bone. There was no evidence of a bony spinal arch at all in the region of marked external swelling. I could pass my finger into the spinal canal below and above, but could see nothing in the bottom of the wound but the flattened spinal cord, which I at first mistook for the posterior common ligament of the spinal column.

At this point of the operation the child's condition became so serious that the wound was quickly closed. Two hypodermic injections of strychnine, $\frac{1}{60}$ grain each, were given, and about five ounces of water were injected into the subcutaneous tissue of the chest by means of a large hypodermic needle and a fountain syringe. The patient was also inverted. No ether had been given for some time before this stage of the operation. Before the administration of ether a hypodermic injection of morphine, $\frac{1}{6}$ grain, and of atropine, $\frac{1}{120}$ grain, had been given.

The child became conscious and spoke a few words, but died

just as she was taken from the operating-table. Death in this case was evidently due to shock and hæmorrhage. The bleeding was not excessive, but was important in a case of such depressed vitality.

The specimen removed shows that the disease was limited to the arches, and did not involve the bodies of the vertebræ. The evidence seems to support the idea that the destruction of tissue, due to tuberculous degeneration, had opened blood-vessels, the bleeding from which had converted the right swelling into a hæmatocele containing fluid blood. I cannot understand the free bleeding that occurred in any other way, for the tumor was dense when punctured with a knife, and seemed to give exit to little except fluid blood, which was venous in color, and which seemed to fill the cavity as far back as my finger could reach. The tumor or swelling did not resemble a spongy sarcomatous tumor, and had no characteristics of an aneurism.

The portion of the spinal column removed consists of five vertebral bodies and a part of a sixth vertebra. The specimen shows no disease of the bodies, and the spinous processes and laminæ of two vertebræ are absent. The gap is due to the removal of the softened bone at the time of operation. The spinal cord which is seen in the foramen of the first and in that of the last vertebræ of the series appears normal, but at the point where the excision of the bone was made, it is so flattened by pressure that the membranes lie close to the posterior surface of the vertebral bodies, resembling ligamentous tissue. An incision through the dura, however, shows the flattened cord within. There are two small openings in the dura at its upper and lower part in this same region, through which some reddish pultaceous fluid escaped when I recently examined the specimen, which had been in alcohol for nearly a year. On the front of the spinal column are two enlarged lymphatic glands.

Pathologist's Report.—By Drs. W. M. L. Coplin and David Bevan.

"After a thorough examination of the specimen (spine) which you sent us, we respectfully submit the following: The specimen consists of five vertebræ, all of which are dorsal; the lowest vertebra contains the extreme upper end of the cauda equina. The upper segment is apparently normal, the second, third, and part of the fourth are the seat of a well-marked pathological process. The laminæ are destroyed, and the base of the spinous process is attacked. The muscular and

ligamentous structures of the morbid area are softened and evidently advanced in some degenerative condition. On the anterior aspect, slightly to one side over the body of one of the diseased vertebræ, are two tuberous masses,—presumably lymphatic glands; the larger is one and a quarter inches in its greatest diameter, by seven-eighths of an inch in its transverse measurement; it is ovoidal in outline, with a slightly-flattened anterior surface. On section it is caseous, the centres of caseation being disseminated at several points, although most marked near the middle. There is a moderately-firm capsule surrounding the mass which posteriorly becomes continuous by blending with the anterior margin of the second glandular mass. The latter is largely caseous, and from its contour, the position of the caseous points, and its general appearance, one is led to believe that only a part of the gland is present.

Histology.—The infiltrated areas show a rich cellular exudate of varying age; some points are recent, others old. Caseation is going on at nearly all points. The muscular, fibrous, ligamentous, and osseous tissues are involved. The glands are histologically typical of tubercle.

Bacteriology.—The bacillus of tuberculosis is to be found in nearly all the surrounding structures of which we made sections. The glands are rich in bacilli."

The pathological report on this case shows, then, that my clinical diagnosis was a correct one. The only other possible diagnosis, it seemed to me, was that of sarcoma of the laminæ, which appeared to me a condition that did not agree with the clinical aspects of the lesion. Dr. William H. Ross[1] gives an interesting discussion on the "Symptomatology of Sarcoma and Massive Tuberculosis of the Spinal Cord." His article, however, is one referring rather to tuberculosis of the cord than to tuberculosis of the bony arches of the spinal column. Mr. A. Parkin[2] mentions, incidentally, a case of "Caries of the Spinous Processes in the Dorso-Lumbar Spine."

[1] Medical Record, August 12, 1893.

[2] Lancet, July 1, 1893, p. 22.

REPORT OF A CASE OF HÆMATOPHILIA, WITH DEATH FROM HÆMORRHAGE FOLLOWING THE EXTRACTION OF A TOOTH.

By H. ELLIOTT BATES, M.D.,

OF POUGHKEEPSIE.

PATIENT was a man twenty-five years of age, single, and was described as having been from childhood delicate. He had suffered from several attacks of rheumatism, painful joints, and digestive disturbances. When a child, a trifling accident had resulted in prolonged and obstinate hæmorrhage. Twice in his life the extraction of a tooth had nearly cost him his life, on account of the persistent bleeding which had been very difficult to check. After enduring a severe toothache for several days, the patient applied to a dentist for relief. Nitrous oxide gas was given, and the tooth, the second right lower molar, was extracted. Hæmorrhage followed, but diminished steadily after the cavity had been packed with cotton. This was at half-past five in the afternoon. Patient went home; went to bed, and, placing a small foot-tub at the side of the bed, repeatedly emptied his mouth as fast as it filled up with blood. Thus he passed the night. In the morning his condition was such that the family resolved to send for a physician.

When seen by the writer, patient was in collapse from acute anæmia. Temperature 99.8° F.; pulse 150, thready and feeble; respiration 24, sighing and stertorous. Great restlessness, mental anxiety, face and lips bloodless, cold perspiration, tinnitus aurium, and dimmed vision. A stream of arterial blood trickled from the mouth. Vomiting of bloody material occurred frequently, followed by attacks of retching which terminated in syncope.

Examination revealed a cavity in the lower jaw, nearly an inch in depth, the tissues of the gum badly lacerated, and the blood welling up with every beat of the heart.

The source of the hæmorrhage was evidently the inferior dental branch of the internal maxillary artery. A hypodermic injection of

whiskey with a fiftieth of a grain of strychnia sulphate was given. The cavity cleared of some masses of cotton and packed firmly with a long strip of sublimated gauze wrung out in Monsel's solution. Thereupon the bleeding ceased, with the exception of a steady ooze from the tissues of the gum, which resisted all attempts to check it.

The restlessness, retching, feeble pulse, and irregular respiration improved greatly after an injection of morphia cum atropia. Stimulation in the form of whiskey and strychnia was administered when indicated, and the patient rallied slowly and imperfectly. Stomach and rectum were intolerant, and nourishment was time and again rejected. Transfusion was not feasible, but the writer determined to make use of a substitute for it which had given excellent results in a similar case. This consisted of throwing under the skin with the hypodermic syringe, at frequent intervals, several drachms of the standard saline solution. An immediate improvement followed. The pulse became fuller and more regular, and at nine o'clock in the evening patient was resting easily. Pulse 100; temperature 100.5° F.; respiration 18. Surface of body was warm, the patient was conscious and spoke of feeling better. At 3.30 A.M. he sank suddenly, the bleeding from the gum increased, but prompt stimulation resulted in prompt reaction.

Stimulants, subcutaneous injections of saline solution, and nourishment, together with constant watchfulness, carried him along until 3.30 P.M., when Dr. Powell saw the case in consultation. His prognosis was unfavorable, and he agreed with the treatment given. He also informed the writer that the patient had been under his care for several months, for anæmia and general debility, without manifesting much improvement after careful treatment. Between 5 and 6 P.M. the radial pulse could not be felt at the wrist, and the patient seemed to be *in articulo mortis*.

Nitroglycerin, warmth, whiskey, and strychnia were used with a happy result.

The writer remained with the patient from 3.30 P.M. until 4 A.M., when he left the case in the hands of Dr. Powell until 10 A.M. The patient had for several hours retained nourishment, the attacks of retching had almost entirely ceased, the pulse was apparently stronger. At 9 P.M. the patient began to sink rapidly, and finally expired at 9.30 P.M., seventy-six hours after the extraction of the tooth.

The family history shows well-marked phthisical taint upon maternal side, while the paternal is markedly neurotic.

No history of other cases of hæmorrhage in either family could be obtained. Patient was the only child. Patient had his first hæmorrhage when a young boy, and these which followed were all of traumatic origin. Patient was light-complexioned, ambitious, and well-developed mentally. The quantity of blood lost was enormous.

The writer has had two similar cases, neither of them fatal, in which bleeding profuse and hard to check followed extraction of a molar tooth in one case, and the snipping of the frænum of the penis in the other.

AN IMPROVED ASEPTIC TREPHINE.

By CHARLES LESTER LEONARD, M.D.,

OF PHILADELPHIA,

ASSISTANT INSTRUCTOR IN CLINICAL SURGERY IN THE UNIVERSITY OF PENNSYLVANIA.

MY purpose in introducing this instrument to the profession is not to improve upon the trephine of Galt, now in common use, but to provide a safe method of using it with greater rapidity and equal precision. The improvement is, therefore, in the mechanical method of applying the power.

The accompanying cut (Fig. 1) illustrates the instrument ready for use. It consists of a fixed handle, in which revolves a shaft to which the force is applied through a double-raised spiral by means of a sliding handle. The trephine is attached to this

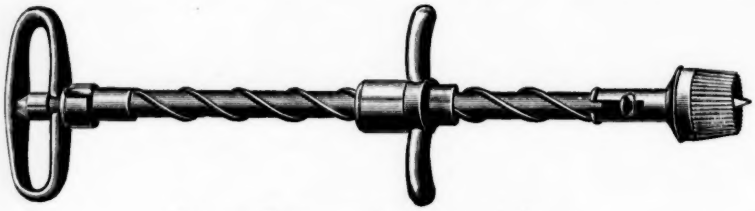

FIG. 1.—The improved trephine ready for use.

by a simple device and rotates with it. Each upward movement of the sliding handle causes the shaft and the attached trephine to make three complete revolutions; while the upward motion by lessening rather than increasing the pressure, and consequent friction of the cutting edge, prevents jamming and makes cutting easy and sure. This improvement, in the application of the power and the rapidity of cutting, will be more easily realized when it is considered that one motion of the hand with the old model produced but one-half of a revolution, while by this method three complete revolutions are made in the same amount of time and with less effort.

By a simple mechanism contained in the sliding handle, the downward or return motion does not rotate the trephine in the reverse direction, and is accomplished rapidly and without effort. The pressure applied to the skull is entirely controlled by the hand grasping the upper or fixed handle, and by a slight deviation from the perpendicular the instrument can be made to cut at any desired point.

The mechanism and aseptic possibilities of the instrument can be more easily understood by reference to the accompanying cut (Fig. 2). The shaft (A) has a double spiral traversing the greater part of its length. At the upper end is a double bearing, which fits into the fixed handle (B), and is held in place by a nut (C). A ferrule (D) protects the fingers. To attach the handle to the shaft, the ferrule (D) is first placed on the shaft, over this

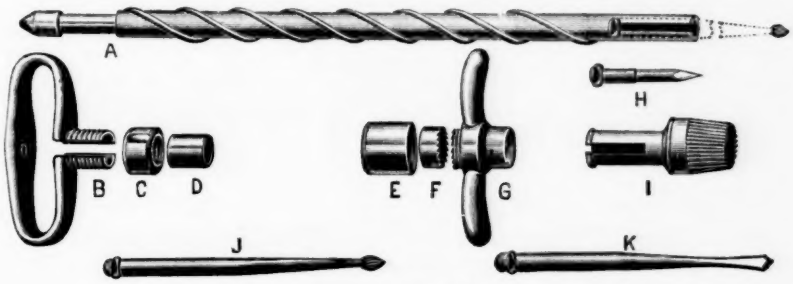

FIG. 2.—Showing separate parts of the improved trephine.

the nut (C), then the pointed bearing is inserted into the handle, the other bearing sprung into place, and the nut lightly screwed on.

The sliding handle consists of three parts, a cap (E), a toothed cam (F), and the handle (G) having reversed teeth. After cleansing, care should be taken to place the parts together as indicated in the cut. The cap should be next to the fixed handle (B), the cam should have its teeth downward, while the handle (G) should be placed so that its teeth interlock with those of the cam; or the parts may be fixed together, in the same position, and then slipped over the shaft.

At the lower end of the shaft is a groove in which is inserted the trephine-pin (H), the trephine (I) is slipped over this, and is

held in place by the thumb-screw of the pin, which thus serves its usual purpose, and also acts as a thumb-screw and nut to bind the trephine to the shaft. In a similar manner drills or burrs are attached to the shaft, the thumb-screw preventing their rotation and holding them in place.

The simplicity of the mechanism makes it wellnigh impossible for the instrument to get out of order, while the aseptic construction and easy separation facilitate cleansing. In using the trephine, the pin should remain down until a considerable depth has been reached; this will prevent the trephine from slipping, as it is liable to do in the hands of a novice, when it first begins to cut. In no case is great force required, as the trephine, depending for its cutting power on the rapidity of its revolution, cuts most rapidly when lightly applied. It should also be borne in mind that it cuts much more rapidly than the ordinary trephine, and the depth of the cut should be more frequently ascertained.

The instrument is portable, weighs about fifteen ounces, and may be obtained, with crowns, drills, and burrs, of any size or in any number, of the manufacturers in Philadelphia.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 24, 1894.

ROBERT ABBE, M.D., President, in the Chair.

MULTIPLE EPITHELIOMA.

DR. JOHN A. WYETH presented a man, aged seventy-six, who was the subject of an epithelioma of the nose, of the ear, and of the neck. Three years ago another sore had appeared over the root of the nose which was excised at Bellevue Hospital, November, 1891, and the wound skin-grafted. The one now on his nose and the one on his neck were present at the time, but were very small and were not removed. The one on his ear has been there thirty-five years. He thinks it followed a frost-bite.

Dr. Wyeth said that epithelioma of the ear was rare, and occurred in women about one-tenth as often as in men. Perhaps this was due to the fact that men were more exposed to frost-bite, the most common cause of the disease in this locality. In this patient the site of the epitheliomata on the nose corresponded to places of irritation by glasses.

LITHOTOMY AND PROSTATECTOMY AFTER FRACTURE OF THE SPINE.

DR. CHARLES K. BRIDDON presented a man, aged fifty years, who four years previously had sustained an injury to his spine in a railway wreck for which he was kept in bed three or four months. During a portion of this time he was completely paralyzed below his waist. He was unable to pass his urine and was catheterized for three months following the injury. His rectum was emptied by means of enemata. In the lower extremities there was also partial anæsthesia, with later paræsthesia. Sensation and motion gradually returned, also control of the bladder and rectum. Before the acci-

dent he was a well-built, robust man, six feet in height. He has never regained his lost flesh and strength, and measurements show him to have lost two inches in height. After three years he began to suffer with symptoms of stone in the bladder. The bladder had been irritable and urination frequent and painful ever since his accident. Examination of the bladder revealed the presence of a stone, which was removed by crushing by a Western surgeon. Most of his symptoms were relieved, but he still urinated frequently and suffered some distress. His vesical symptoms gradually returned, causing him to enter the Presbyterian Hospital for relief in November, 1893. Examination of his spine showed a marked antero-posterior curve, convex posteriorly, with the second lumbar vertebra most prominent; also a slight lateral curve, convex to the left. The spinous processes of the lower cervical vertebræ were unusually prominent. No change in sensation is made out. Patient still complains of abnormal sensations in the lower extremities.

Examination of the bladder revealed the presence of stone.

By suprapubic section five calculi were removed; the largest was the size of a large walnut; some of the smaller ones were apparently fragments left from the former crushing. The middle lobe of the prostate was then found to project into the opening of the urethra for a distance of nearly three-quarters of an inch. By means of loops of silk the bladder-walls were held aside, and the orifice of the prostatic urethra brought into view. The top of the projection of the middle lobe being seized with vulsellum forceps, it was removed with a few cuts of the scissors. The bleeding was controlled with a tampon of gauze, inserted into the urethral orifice after Keyes's method.

An iodoform gauze drain was placed in the bladder, a large aseptic sponge placed over the wound to absorb the escaping urine. A gauze dressing applied and patient sent to the ward.

When presented, the condition of the patient was excellent, his recovery having been uneventful; what remained of the paresis of the lower extremities has been manifestly improved by faradization and massage, the fistulous track communicating with the bladder was closed by the end of the sixth week, and he then had to urinate about every two hours.

The specimen presented was about the size of the ungual phalanx of the thumb. The largest calculus weighed 397 grains, the combined weight of the smaller fragments 125 grains. Composition, ammoniaco-magnesian phosphates.

PLASTIC OPERATION ON THE HAND.

DR. ARPAD G. GERSTER demonstrated the result of a plastic operation performed on the hand of a woman for deformity following an extensive burn, occupying the dorsum of the thumb, the index, middle, and fore fingers partially, and the fifth finger. The index, middle, and fore fingers were connected by a cicatricial web which extended quite a distance over the middle phalanx. Flexion of the fingers was possible only to a very limited degree, and that in the metacarpo-phalangeal joint. The fingers themselves could hardly be bent. The cicatrix was massive and dense and apparently extended down to the sheath of the extensor tendons. The material for the flap with which to cover the defect after excision of the cicatrix was taken from the inner surface of the other arm. A flap was raised from the arm, containing all the constituents of the skin, and having its base attached on the radial side, both arms were fixed in plaster-of-Paris splint and placed in such relation to each other that the flap was laid easily on the defect on the hand, to which it was loosely attached by three or four stitches to keep it in contact. The two arms were fixed in this relation, suspended, and the patient was put to bed. Ten days afterwards the adhesion of the flap was sufficiently secure to enable him to divide the pedicle. Then the flap, which was a generous one, was divided into a number of finger-like projections which were implanted into the interspaces between the fingers, and were used to cover the dorsum of the corresponding fingers, and the flap was finally attached all round by sutures to the margin of the skin. The ability to flex and use the fingers and hand has improved greatly.

The method employed in this case is known as Maas', and has been used mostly in defects of the lower extremities, especially of the heel. Two cases especially of this character the reporter recalled out of his own experience, in which he had covered extensive defects of the heel, and a third one of extensive defect over the patella. In the latter the whole integument over the patella and the head of the tibia had been torn away in a railroad accident. The flap was taken from the other extremity for its repair, and the result was most satisfactory.

Dr. ABBE remarked that it seemed to him that no method gives better results than the one described, as to sensibility and usefulness of the limb. He doubted whether the Thiersch graft would give as much flexibility and solidity as had been obtained in this case by Dr. Gerster. Still, in his experience Thiersch's grafting gave much

satisfaction, especially in cases of defect around the wrist. In two or three cases under his care these grafts had thickened up in the course of time. Although they ever remained mosaics, yet they become thickened like true skin and do not break down. In one of the cases both wrists were encircled by ulcers, following the burning of a pair of celluloid cuffs *in situ*. The burning was to the third degree. Thiersch's grafts were applied and gave a perfectly satisfactory result. He had used the method described by Dr. Gerster with admirable results in a case of defect at the heel; also in a case of defect on the palm of the hand, although in the latter instance the mass was rather voluminous and flabby. It was taken from the thigh.

TORSION FOR THE CURE OF RECTAL INCONTINENCE.

Dr. Arpad G. Gerster read a paper in which he stated that in the causation of rectal incontinence two factors are to be considered, —first, the inefficiency or absence of the sphincter muscle; and, secondly, the character of the digestive process, upon which depends the state of cohesion or solidity or fluidity of the fæces when they approach the breach.

The latter factor in most instances can be influenced so as to enable the patient to hold his stool for twenty-four hours. Properly-selected diet, astringents, and small doses of opium will produce a solid column of fæces. But in a small fraction of cases, where the peristaltic motion is habitually lively, all these expedients will fail, and the patient's condition is then pitiable indeed.

In considering the remaining factor,—that is, the state of the occlusive apparatus of the breach, while incontinence due to paralysis of the sphincter caused by spinal disease or injury should be mentioned, for obvious reasons he did not intend to dwell on it at this time.

In a more numerous class of cases the sphincter has been rendered useless by one or more incisions, carried through its entire thickness by the surgeon's knife, usually for the cure of fistula. Whenever these incisions are not too numerous, the nerve-supply of the divided segments of the muscle intact, they should be reunited by suture, and the result will be very satisfactory. Where the nerve-supply is permanently damaged by incisions, cicatricial retraction and atrophy having followed, this plan will be found non-feasible. Plastic measures directed towards the mere narrowing of the breach are also

of a very doubtful value, and torsion will be found a most valuable aid in re-establishing continence.

The function of the sphincter is sometimes damaged by ulcerative processes in its neighborhood, followed by massive cicatricial deposit in and around this muscle, resulting in stricture. In these cases rebellious constipation alternates with just as obstinate diarrhœa. During the latter incontinence is the most distressing feature of the trouble.

As in the preceding group, so was surgery hitherto unable in this latter one to afford permanent relief. At present, after excision of the cicatrix, torsion offers a very fair promise of success.

Next must be considered the cases in which the sphincter is entirely absent. This absence may be congenital or acquired.

Congenital absence of the sphincter occurs often in congenital atresia of the anus and oftener in atresia of the rectum. Dr. Gerster observed one of these cases in an adolescent complicated by prolapse, and cured the trouble by torsion.

Torsion was first employed in surgery by Gersuny, of Vienna, who published in *Centralblatt für Chirurgie*, 1889, a successful cure by torsion of a case of vesical incontinence due to paralysis of the sphincter. In the beginning of 1893 he transferred the same principle to two cases in which the rectum and sphincter had been excised for neoplasm. The procedure is very simple, and consists in the rotation around its own axis of the freed end of the gut, so as to arrange the rectal walls into a rather close spiral twist. The twisted gut is then stitched to the edges of the outer wound. To make a comparison, a smooth bore, as it were, is thus converted into a rifle. The amount of torsion is to be gauged by the amount of resistance felt by the index finger on introduction.

The greatest number of cases of incontinence is produced by operations, wherein the sphincter must be sacrificed in eradicating neoplasms. Here torsion is eminently indicated as the concluding step of the operation. It does not involve additional risk by loss of time or loss of blood, and its results are excellent, as Gersuny's and Gerster's cases show. The author recounted the history of a case of incontinence, following extirpation of the rectum, in which the trouble was cured by torsion. This patient was presented to the Surgical Society. Torsion would seem to be applicable also to certain cases of colotomy.

The amount of torsion which Dr. Gerster had made had been

graduated according to the amount of resistance encountered. While he did not make more than one complete twist in the two cases reported, he would not hesitate to do so if it were necessary. If the loosened end of the rectum were long it might be necessary to make more than one circle of torsion. For example, if five or six inches of the rectum had been excised, and the loosened end drawn down, it is probable that more than 360 degrees torsion would be necessary in order to secure the amount of resistance that is desirable. If the rectum was not twisted at once, the surgeon would have to wait for the rectum to become fixed by a deposit of granulations to the adjoining soft parts, then loosen the lower end two or three inches, and twist it to the degree which might be required. Experience will have to teach which of these procedures will deserve the preference. He had never employed torsion immediately after extirpation. In both of these cases reported the rectum was dissected out, the proximal end where the dissection ceased was firmly attached, and formed a fixed point, from which torsion was made.

CASE OF INTRAUTERINE AMPUTATION.

Dr. A. J. McCosh presented a patient illustrating intrauterine amputation of the arms. He said: "The baby is eleven weeks old, the child of healthy young parents. There was nothing peculiar about the pregnancy from beginning to end. There is no history of traumatism or of syphilis. The mother was delivered by a midwife; the labor was not especially severe or protracted. The baby was born with the right upper extremity terminating apparently at the elbow, the left at a point which would be about the junction of the lower and middle third of the arm. The forearm on each side is wanting. On the end of the left arm are two minute fleshy projections. The left thigh shows a deformity due to bending of the femur near its middle, and subsequent ossification in this faulty position. Both the midwife and the mother are positive that none of the amputated members were expelled either with the child, or placenta, or in the lochia." Since there is nothing in the history to account for the amputations, the reporter fell back upon the theory of amniotic folds, or of strangulation by the cord.

Dr. Abbe remarked, regarding Dr. McCosh's case, that the spreading out of the end of the humerus, and the presence of two or three fleshy growths, would seem to point to arrested develop-

ment with an attempt at the formation of the elbow and rudimentary fingers rather than to amputation.

Dr. McCosh was still inclined to think the case was one of amputation, although it was impossible to say so with certainty. There was a difference of an inch and a quarter in the length of the two stumps, and the deformity of the thigh appeared to him to be due to a like cause,—*i.e.*, pressure by an amniotic fold, which, however, was removed before complete severance of the limb had occurred.

Dr. Briddon said he had presented a specimen before the Pathological Society about twenty-five years ago somewhat similar to Dr. McCosh's case. It called out a good deal of discussion as to the cause of the condition, whether it was due to arrested development or to amputation by the funis. In his case it was thought not to be due to arrest of development, nor to amputation by the funis, but rather to amputation by some other constricting band. One thigh was cut down to the bone as if by a thread, yet the leg on that side was of the same size as the other. He believed the fingers and thumb of the opposite upper extremity were similarly involved, so that it seemed impossible for the funis to have been the cause, especially as this was found at the labor around the child's neck, and in a healthy condition.

CASE OF HYPERTROPHY OF THE TIBIA.

Dr. McCosh presented a girl, ten years of age, who had always been, except for the condition shown, a healthy child, having had none of the exanthemata, and giving no history of continued fever during childhood. About two years and a half ago the mother noticed that the left leg was longer than its fellow, and that there was a distinct bend in the middle of the tibia. The curvature has been slowly but steadily increasing, as has also the length of the leg, until now it is two inches and a half longer than the right. The increase in length has been entirely in the diaphysis of the bone, below the tuberosity of the tibia. There has also been an increase in the thickness of the tibia. The bone feels perfectly smooth and the enlargement is uniform. There has never been any pain or tenderness on pressure. The girl walks almost without a limp, the pelvis being tilted. There is no history of injury. The question arises, What is the cause of the increased length of the tibia? Has it been caused by an osteo-myelitis which has left a sequestrum either in the head or in the shaft of the bone, by a

syphilitic osteitis, or by a new growth? There is a specific history on the father's side, and the mother has also probably had syphilis. He requested the opinion of the members with regard to the causation and the treatment.

Dr. GERSTER was inclined to look upon Dr. McCosh's second case as one of congenital syphilis, rather than one of a simple inflammatory condition, allied with the various forms of osteo-myelitis. He had observed cases identical with this, having marked elongation of the tibia with curvature forward, and in several had performed an operation to correct the deformity. The characteristic sclerotic osteitis peculiar to congenital syphilis—the bone resembling ivory—was found. The bone was very anæmic, the solid constituents very dense and massive, the medullary canal obliterated. The protuberance was chiselled away, but the elongation was not so great that he had thought it necessary to shorten the bone. In children there was pain, thickening of the periosteum, the outer surface of the bone being more vascular than the deeper portion, pointing apparently to a still active process. He had been gratified to see that the process had ceased after the operation. It would seem, therefore, that removal of the upper layer of bone stops the process, and causes the pain and other inconveniences suffered by the patient to disappear, to a considerable extent at least. If the elongation were to become much more marked in the case presented, he thought shortening the limb by excision could be considered.

CESSATION OF EPILEPSY AFTER TREPHINING AND TYPHOID FEVER.

DR. MCCOSH presented a third case, that of a girl, seven years of age, who had been an epileptic a number of years, having had as many as five or six convulsions a day. There was partial paralysis of the right upper extremity with some atrophy of the muscles. The same condition existed in the right lower extremity, but in less degree. He trephined her in March, 1893, over the left motor area, and after removing a considerable area of bone, came down upon a reddish membrane situated between the dura and brain, which was as thick as a sheet of note-paper and about two inches in diameter. It was removed. The convolutions appeared atrophic. She made a rapid recovery from the operation. The convulsions, however, were but little altered, but there was slight improvement in the paralysis.

The peculiar point in the case, however, is to come. At the end

of the following September the convulsions became more numerous, twelve to eighteen in twenty-four hours, and she was sent to hospital for further operative treatment.

After she had been there a day or so, she was found to have typhoid fever. The case ran the usual course, although it was somewhat prolonged and severe; but since the first week of the fever the child has not had a convulsion or spasm of any kind. It is now two months since the fever has ceased, and not a convulsion or even a twitching has occurred. She is brighter and appears better in every way, even the paralysis of the muscles having improved.

Dr. WYETH said that he had seen an analogous condition in two patients,—namely, adhesion between the dura, pia, and the brain in epileptics, in one there being also atrophy of the underlying convolutions. In one marked improvement followed trephining during about six months, then the attacks recurred, but were less severe and less frequent than previously. Dr. Wyeth then related the histories of two cases in which he had recently trephined for epilepsy. Immediate improvement had followed in each instance, but the ultimate result was yet to be seen.

Dr. ABBE remarked that it seemed to him that surgery is lacking in some measure with regard to remedying the defect of adherent dura and brain. This lack had the promise of being filled by Dr. Beach, of Boston, who had trephined in a case of epilepsy, freed the adhesions between the dura and brain, and there was relief from the convulsions about the usual time,—six months. They then recurred. He exposed the area a second time, freed the adhesions, and put in a sterilized plate of gold foil upon the brain to prevent the reformation of the adhesions. About two months afterwards the convulsions had not recurred. This seems an ingenious and perhaps useful method of preventing the immediate formation of adhesions between brain and membranes after trephining, for it would seem that simply breaking up the adhesions could be of only temporary benefit.

Dr. GERSTER said that he had demonstrated last winter before the Neurological Society a patient on whom Beach's plan had been applied. It was a case of cyst of the motor area, with characteristic Jacksonian epilepsy. The cyst was exposed and drained, and after three or four months the epileptic seizures, which had never resulted in total unconsciousness, returned, and as adhesions had evidently formed at the site of the operation, he adopted Beach's plan and implanted a piece of gold foil between the brain and dura, ascer-

taining at the same time that the cyst had not reformed. The girl was free from seizures again for three months, but they then recurred. He believed that the epileptic seizures did not depend upon adhesions at all, and that if they were not due to the establishment of a vicious circle, the cause was cicatricial deposit in the brain-matter. We cannot make a puncture or resection or do anything to the gray matter without causing a cicatrix, and, therefore, he was not as much of an enthusiast as some are with regard to the success to be obtained by operation in cases of epilepsy. Yet if we cause only a temporary cessation of numerous and severe convulsions, such as were present in Dr. McCosh's case, we are accomplishing a great deal.

STRANGULATED HERNIA OF A FALLOPIAN TUBE.

DR. JOHN A. WYETH narrated the history of a woman, aged thirty-eight years, upon whom he had been called to operate when *in extremis* from what appeared to be a strangulated right inguinal hernia. In the sac when opened was found simply a swollen, darkly-congested Fallopian tube. Pus and fæces welled up from the abdominal cavity through the neck of the sac. Free enlargement of the incision through the abdominal wall revealed a loop of small intestine gangrenous and ruptured, having been caught and strangulated by an old adhesive band. An artificial anus was made after the abdominal cavity had been cleansed. The patient died six hours later.

EDITORIAL ARTICLES.

THE TREATMENT OF TUBERCULOUS PERITONITIS.

THE interest which has of late years been taken in tuberculous peritonitis is almost unbounded, and as a result the literature of the subject has attained to dimensions which are nearly as limitless.

Few diseases exhibit more curious problems in pathology, more protean aspects at the bedside, or more strange revelations of the unexpected than does the common affection now under consideration.

The morbid anatomy and clinical manifestations of tuberculous peritonitis it is not the intention to consider in this article, except to allude very briefly to a few matters which bear upon the subject of treatment.

No age is free from tuberculous inflammation of the peritoneum. It appears to be most common between the ages of twenty and forty, while it is also frequently met with in children.[1]

It is curious that authors are not agreed as to the influence of sex in the production of the trouble. Some say it is more common in males and others in females. Statistics obtained from *post-mortem* records appear to show that tuberculous peritonitis is more often met with in males, while the list of cases treated by operation show that the majority of the patients operated upon are females.[2] The latter circumstance has been explained by the fact that in women the peritonitis often starts from the pelvic organs and presents itself in a form which suggests and encourages operative treatment; whereas in males the condition is apt to be more general and to be associated with

[1] Osler, Johns Hopkins's Hospital Reports, Baltimore, 1890.

[2] Helmrich, Basel, 1892. See also Koenig, Central. für Chir., 1890, p. 657, and Wagner, Deutch. Arch. f. klin. Med., 1884, Bd. 34.

primary tuberculosis in a less favorable position or to appear in a form less suggestive of operation.

The *clinical phenomena* follow no uniform course and are susceptible of infinite variation. Sometimes the trouble begins acutely with rigor and fever attended by digestive disturbances, irregular bowels, colicky pains, and the local manifestations of peritonitis. Certain cases have in their early symptoms resembled typhoid fever. In an isolated example or so the first manifestations have been mistaken for those of perforative peritonitis.

In the great majority of instances the onset has been quiet and stealthy. There is some disturbance in the function of the stomach and intestine, some trifling colic, a steady swelling of the abdomen, and above all a steady wasting. There is irregular fever and a marked fitfulness in all the symptoms. Constipation alternates with diarrhœa, and vomiting may become a notable symptom. In the course of the disease remissions and relapses, and periods of unaccountable improvement are common, but in spite of any hopeful signs there is a general evidence of losing ground and of undoubted declining.[1]

The abdomen becomes considerably swollen and may exhibit almost every possible gradation and combination of tympanites and dulness of percussion. More or less exudation is usual, and this may be general or may be confined to one or more districts: the intestines may be matted together into a cyst-like mass, the omentum may be rolled up into a solid ball not to be readily distinguished from a substantial growth. Adhesions may lead to a multitude of curious phenomena discoverable on palpation. Here may be an area of resistance and there a void, here all the manifestations of coils of intestine bound down by bands and fillets, and there the signs of bowel floating free in a thin fluid. There may be the phenomena of abscess on one side of the abdomen and the physical signs of ascites on the other.

It is no matter of wonder that tuberculous peritonitis is very commonly the subject of a mistake in diagnosis.

[1] Burghausen, Mitth. aus der Tub. Polikl., October, 1892, and Vierordt, Zeit. f. klin. Med., 1887–88.

The curious mimicry met with in this disease has led to the diagnosis of cyst of the mesentery or liver, of tuberculous kidney, of ovarian tumor, of cancer of the omentum or peritoneum, of perityphlitic abscess, of internal hernia, and of fibroma and sarcoma of the abdominal wall. In each of the instances mentioned—to quote no others—an operation has been carried out for the purpose of exploring or of relieving the condition imitated by this fantastic disease.

The *morbid anatomy* of the affection follows, moreover, on more regular lines. From an examination of bodies after death, it would appear that tubercle may reach the peritoneum direct from the pleura, through the diaphragm, or may spread to it from the intestine, or from a tuberculous mesenteric or retro-peritoneal gland, or may have had its starting-point in some tuberculous disease of the female generative organs.[1]

Tuberculous peritonitis may be the only manifestation of tuberculosis, although it is more usually secondary to a like process elsewhere.

In the majority of cases a large quantity of exudation is present, the peritoneum is opaque, it tends to become thickened, and the intestinal loops are prone to adhere together, and the adhesions thus formed may be very firm.

The omentum is commonly rolled upwards, and is found adherent to the anterior abdominal wall. Its layers are matted together, and often show extensive tuberculous changes.

The mesentery tends to become thickened, but not to be so shrunken as the omentum. The intestines are usually distended, and the belly markedly and uniformly swollen. The umbilicus is often protruded.

The ascitic fluid present usually shows three to five per cent. of albumen. It is slightly opaque, greenish yellow, and but seldom blood-stained. In this exudation the tubercle bacillus is but rarely to be demonstrated. The fluid may persist after the tubercles have

[1] The pathogenesis of the disease is well dealt with by Borschke, Virch. Archiv, Vol. CXXVII, p. 121, and Phillips, Göttingen, 1890.

disappeared. Peritoneal effusion may depend upon tuberculous trouble in the retro-peritoneal tissue.

Now and then the mesenteric glands are found to be the seat of extensive tuberculous changes. They are seldom, however, conspicuous in the marked cases of peritonitis. The instances in which they are most prominent are commonly those in which there is either no peritonitis, or but a slight manifestation of it. These glands, when matted together, may form a large single tumor, which has been mistaken for an enlarged spleen or a movable kidney, or they may form many large and independent tumors, or numerous small and isolated glands may be found dotted over the whole of the mesentery. In three cases[1] in adults, the limited glandular tumors have been removed by operation. In one the mass was incised, scraped, and drained; in the second case the glands were enucleated, and in the third instance they were removed piecemeal. The first patient died of septic peritonitis, the two latter recovered.

Aldibert[2] records the case of a little boy, aged six, who presented symptoms of tuberculous peritonitis with ascites. Laparotomy was performed. No peritonitis was found, but numerous tuberculous glands secondary to tuberculous enteritis were met with. The abdomen was washed out and the wound closed. The patient made a good recovery.

Intestinal obstruction is not uncommon, as a result of tuberculous peritonitis, and may depend upon bands, upon the bending or kinking of intestine, upon the agglutination of the bowel loops, or upon intestinal paralysis.

The Treatment of Tuberculous Peritonitis by Laparotomy.—The early operations in this form of peritonitis were unintentionally performed. The abdomen was opened under the belief that the patient had an ovarian or other cyst. Tuberculous peritonitis was discovered, the abdominal wound was hastily closed, and, to the infinite surprise of the surgeon, the patient recovered.

[1] Quoted by Pic, Thèse, Lyon, 1890, and by Pean, Gaz. Hôpitaux.

[2] De la Laparotomie dans la Péritonite Tuberculeuse. Thèse de Paris, 1862.

The well-known case reported by Sir Spencer Wells was operated upon in 1862. Somewhat like operations were carried out by Petri, in 1874, and Dorhn, 1878. Koenig,[1] in 1884, published three cases of tuberculous peritonitis deliberately treated by laparotomy, and urged this measure as a regular mode of treatment.

In the consideration of the subject of the treatment as carried out at the present time, I cannot do better than adopt the arrangement and utilize the statistic of Aldibert, whose elaborate treatise on the subject forms, without doubt, the most valuable monograph of recent years.

In order that a fair idea may be obtained of the result of surgical treatment under the manifold conditions which tuberculous peritonitis presents, Aldibert classifies the disease under three headings,—

(1) The ascitic form; (2) the fibrous form; (3) the ulcerous form.

(1) *The Ascitic Form.*—(*a*) When acute and involving the whole peritoneal surface, the condition is that of acute miliary tuberculosis. More usually the tuberculous process, although in no way limited within the abdomen, is either (*b*) subacute or (*c*) chronic. In such cases, very numerous gray granulations, which tend to become confluent, are found all over the inflamed serous membrane. There is abundant ascites. The fluid is citron-colored, sometimes blood-stained, and rarely sero-purulent. No adhesions are discovered, or, if any be present, they are scanty and insignificant. Lastly, the peritonitis may be (*d*) chronic and encysted, the morbid appearances being the same, but the trouble being limited by adhesions.

In general terms, it may be said that the clinical features in the ascitic form are marked by malaise, fever, headache, wasting, vomiting, and constipation. There is meteorism of the abdomen, which is tender, and which presents evidences of ascites.

(2) *The Fibrous Form.*—In this variety of the trouble it is apparent that the tuberculous process is moving in the direction of recovery. There is a considerable development of fibrous tissue, and

[1] See his paper in Central. für Chir., 1890.

evidences of an inflammation of a robust type. Ascites, if present, is always slight. The fluid is clear and very rarely sero-purulent.

Two varieties of the fibrous form may be recognized: (*a*) The dry variety. Here tubercles are found disseminated over the whole serous membrane, without ascites and without adhesions. The tubercles are large, and are, by their size, distinguished from the nodules of acute miliary tuberculosis. This variety is supposed to represent a particular stage in the progress towards recovery. It is met with just after the absorption of the ascitic fluid, which absorption is a feature in the cases which are ending well, and just before the development of adhesions.

(*b*) The adhesive variety. This is marked by adhesions, which may be general and extensive. The coils of intestine may be matted together by firm bands, or a mass of adhesions may spread over the whole of the abdominal contents.

In its clinical aspect, the fibrous form is associated with a subacute and insidious onset, with moderate fever, no great impairment of health, the absence of marked vomiting, and constipation alternating with diarrhœa.

It may end in recovery or pass on to the ulcerous form.

(3) *The Ulcerous Form.*—This form is associated with caseation and the breaking down of the tuberculous products. Three varieties are described. (*a*) In the dry variety, when the abdomen is opened, there is presented a confused medley of intestines matted together and to the parietes, and a serous membrane covered with yellowish or gray adhesions, thick and infiltrated with caseous deposits in one place and still unchanged tubercle in another. The whole of the intestines may be buried in one fibro-caseous mass. When the adhesions and the attached coils are separated, innumerable loculi are made evident. Some contain clear fluid, some caseous material, some a chocolate-like matter, and a few may contain pus. The adhesions are of every possible variety, disposition, and density. Here and there two adherent coils of bowel may communicate by a fistulous opening, or there may be a fistula discharging fæces at the navel.

The suppurative variety exhibits precisely the same general changes as the dry form, but there is in addition more or less abundant suppuration, which may be (*b*) generalized or (*c*) encysted.

The clinical aspect of the ulcerous form is represented by patients who are wasted and miserable-looking, who have probably been long ill, who exhibit a considerable degree of fever, especially at night, who are feeble and the subjects of profuse sweating, together with vomiting and diarrhœa. The belly is large, and there are areas of dulness and of resonance, with hard masses in some parts and fluctuation in others.

Aldibert deals with 308 cases of tuberculous peritonitis of various forms treated by laparotomy.

The general results of this measure are presented in the following summary:

THREE HUNDRED AND EIGHT CASES OF TUBERCULOUS PERITONITIS TREATED BY LAPAROTOMY.

I. *The Ascitic Form.*

(*a*) Acute cases; 2, both ending fatally.

(*b*) Generalized, subacute; 18 cases, 7 deaths. Mortality 38.8 per cent. Cures 61.2 per cent.

(*c*) Generalized, chronic; 64 cases, 15 deaths. Mortality 23.4 per cent. Cures 73.4 per cent.

(*d*) Encysted, chronic; 65 cases, 7 deaths. Mortality 10 per cent. Cures 80 per cent.

Summary of the 149 Examples of the Ascitic Form.

Deaths	31
Improved	2
Stationary	6
Cured	101
	140

Mortality due to operation, 2.6 per cent.

General mortality, 20 per cent.

General percentage of cures, 73.8 per cent.

35.4 per cent. of the total cures can be regarded as complete recoveries.

II. *The Fibrous Form.*

(*a*) Dry variety; 1 case, which recovered.

(*b*) Adhesive variety; 25 cases, 5 deaths.

General mortality in the 26 cases, 19.2 per cent.

Percentage of cures, 76.9 per cent.

Forty per cent. of the total number of cures can be regarded as complete recoveries.

III. *The Ulcerous Form.*

(*a*) Dry variety; 4 cases, 3 deaths.

(*b*) Suppurative, general; 6 cases, 2 deaths.

(*c*) Suppurative, encysted; 12 cases, 4 deaths.

General mortality in the 22 cases, 40.9 per cent.

Percentage of cures, 59 per cent., of which about one-fourth can be regarded as complete recoveries.

IV. *Tuberculous Peritonitis Arising from the Genital Organs.*

Forty-one cases, 14 deaths.

General mortality, 34.1 per cent.

Mortality from operation, 4.8 per cent.

Percentage of cures, 56 per cent.

To the above list of 238 cases the author adds 70 other cases of tuberculous peritonitis treated by operation, which are published without details. Among these 70 cases are 15 deaths.

General Summary.

Cases treated by operation	308
Deaths	74

Mortality due directly to operation, 2.5 per cent.

Cures, 215.

Percentage of cures, 69.8 per cent., of which number 33.4 per cent. can be regarded as complete recoveries.

In 50 of the above 308 cases tubercle was demonstrated, either histologically or bacteriologically. Among this number are 7 deaths, 39 cures, and 4 examples of non-improvement.

INDICATIONS FOR OPERATION AND METHODS OF OPERATING.

(1) *The Ascitic Form.*—It is needless to say that operation is contraindicated in cases in which general acute miliary tuberculosis exists. It has also proved to be of no avail in examples of acute

miliary tuberculosis limited to the peritoneum. In the subacute and chronic forms, operation has been attended with good results.

It will be seen that the best effects have followed in the chronic cases, and especially in those in which the peritonitis was encysted. The existence of fever is no bar to operation, and it has not been shown that the laparotomy has caused the tuberculous process to become more diffused about the body. It has been estimated that in the medical treatment of the ascitic forms, 9.5 per cent. are cured, 19 per cent. die, and 71.5 per cent. remain unimproved.

With regard to the method of operating, it has been shown that repeated puncture is of no avail in the great majority of instances. It is uncertain, imperfect, may lead to hæmorrhage, and has led to fatal wound of the gut. Every variety in the method of performing laparotomy has been placed on record. In some, after a simple, free incision with evacuation of the fluid, the abdominal wound has been closed. In other cases the peritoneal cavity has been flushed out, either with sterile water or some antiseptic solution, and the wound then closed. In a third class of cases the serous sac has been drained, either with or without a previous flushing. In a fourth series the peritoneum has been treated with some drug; such as iodoform, iodine solution, or solution of carbolic acid, or of corrosive sublimate.

In the cases of generalized peritonitis the best results have followed simple incision, without either flushing or drainage. The cases treated by irrigation show 72.5 per cent. of cures; those not irrigated show 74.3 per cent of cures.

Drainage is not necessary, and, indeed, drainage of the whole cavity is impossible. Relapses are as common in the cases drained as in those not drained. The gauze drain is better than the rubber tube. Fistulæ have been somewhat common after the use of the tube.

In opening the abdomen it is well to remember that the peritoneum may be considerably thickened, and that the gut may be

adherent to it. All the fluid should be evacuated, and the peritoneal cavity may, if necessary, be mopped out. Adhesions should not be disturbed, and the omentum, if extensively tuberculous and rolled up, may be excised.

In the encysted form it is desirable that the localized collection should be cut into directly. Irrigation is not called for, and those cases have done best in which no drain was employed. Sinuses are very apt to follow the use of the drainage-tube. If any drain be employed it should be of gauze.

In a few cases the wound has given way after the operation, and more fluid has escaped. In other instances fæcal fistulæ have formed, or the wound has become the seat of tuberculous ulceration.

Among the examples of operation in the ascitic forms, there were 14 relapses (in 140 cases); 3 were in children, and these were ultimately cured; 11 were in adults, of these 1 died, 3 remained stationary, and 7 recovered. In the whole series, therefore (140 cases), the percentage of relapses is only 9.4 per cent.

In five of the relapsed cases in adults, a second laparotomy was performed. Of this number 1 died, 2 were cured, and 2 remained unrelieved.

(2) *The Fibrous Form.*—In the dry variety, operation has not been advised by many, as it is assumed that the case is progressing towards cure. Aldibert, however, urges it. He points out that the laparotomy can do no harm, and that the case—if left alone—may relapse or pass on to the ulcerous form.

In the adhesive variety operation is seldom called for. The condition is one moving in the direction of cure, and it is the opinion of most surgeons that this form of tuberculous peritonitis may be left to medical measures.

Laparotomy may be carried out if there be much fever, if the health be failing, if suppuration be suspected, or if there be much pain or any symptoms of intestinal obstruction.

The operation is rendered very difficult by reason of the adhesions, which should be handled with the greatest care. The best

results have attended incision and irrigation without drainage. If many adhesions be broken down, then a drain is called for.

Several cases of fæcal fistula have been noted in connection with operations upon this variety of peritonitis.

(3) *The Ulcerous Form.*—The operation is considered by most to be contraindicated in the dry form, and in those examples of the encysted form, in which the pus is pent up in numerous loculi. The complete evacuation of all these collections involves serious and widespread damage.

In all other forms of the trouble laparotomy followed by drainage is distinctly to be advised. In the majority of instances recorded the diseased serous cavity has been treated by irrigation.

In these cases the less the adhesions are disturbed the better.

Pic has made the following estimate of the prospects of a patient suffering from the ulcerous variety of tuberculous peritonitis. Of children treated without operation one-third recover, of adults treated without operation one-fifth recover, of cases treated by operation four-fifths recover.

The Manner in which Laparotomy Effects a Cure.—This subject has led to considerable speculation, but at present to no completely satisfactory answer. The operation does not act by producing adhesions, since, as a rule, none form. It would not appear to act by exciting a more robust inflammation, for in the majority of cases no such reaction is evident.

Lauenstein has assumed that the beneficial effect is due to the removal of the fluid and the admission of light, and he points out that light and the absence of moisture are hostile to bacterial growth. Cameron suggests that the incision allows of the escape of the ptomaines and toxines, which are produced by the bacteria. Mosetig-Moorhof considers that the main element in the cure is the admission of air into the peritoneal cavity. Nolen holds the same views, and has reported some cases of tuberculous peritonitis which were cured by pumping sterilized air into the peritoneal cavity.

Not a few writers ascribe the good effect of the simple incision to

modifications in the state of pressure within the abdomen and to an improved circulation, and more active absorption, due to some ill-defined readjustment of that pressure.

It is remarkable that an actual incision appears to be necessary, as repeated observations have shown that puncture of the serous cavity leads but seldom to any improvement.

FREDERICK TREVES.

WUNDERLICH ON CLINICAL OBSERVATIONS ON THE EFFECT OF CHLOROFORM AND ETHER NARCOSIS ON THE KIDNEYS.[1]

WUNDERLICH has made examinations of the urine in 125 cases, before and after anæsthetization, in the clinic of Professor Bruns. Albumen was found in five cases before operation, but it was found after operation in eighteen cases. All of the five albuminous patients were anæsthetized with ether, and in three of these the amount of albumen was increased after the anæsthetic. Of the thirteen cases which showed albuminuria for the first after the administration of the anæsthetic, six had been given chloroform, six had been given ether, and one mixed narcosis. All of these patients had no fever on the day when the albuminuria developed, or only to a very slight degree. Antiseptic poison cannot be held accountable for the occurrence of albumen, for scarcely anything of this sort was used in the operations; only a small amount of iodoform powder was dusted over the sutured wounds, and, occasionally, a small bit of iodoform gauze, or an iodoform tampon was used. Acute anæmia was in no case a cause of the urinary changes, for in all of the operations but little blood was lost. It therefore remained only to regard the ether and chloroform as responsible for the kidney complications.

The albumen which appeared in these thirteen cases was only in a small amount, scarcely more than a trace, and gave simply a

[1] Beiträge zur klinischen Chirurgie, Band XI, Heft 2, 1894.

cloudiness to the tested fluid. No such a deposit as can be obtained in cases of real nephritis was observed. Of these cases the albumen disappeared in ten on the first day, in two on the second day, and in one case it disappeared on the fourth day after the operation. In this last case a rise of temperature which developed after the operation may be held accountable for the continuation of the albuminuria.

Albumen appeared in 6.9 per cent. of the cases of ether narcosis, and in 11.5 per cent. of the cases of chloroform narcosis.

A most important observation in these cases is the appearance of casts, because these can come only from the kidney itself.

Before the anæsthetizations casts were present in thirty-seven cases of non-albuminous urine. This is quite in harmony with Alber's observations, who found in non-albuminous urine of men, hyaline casts in 30.9 per cent. of the cases examined, granular casts in 1.8 per cent., and epithelial casts in 1.8 per cent.

Wunderlich found casts in fifteen cases out of sixty-one cases of ether narcosis (24.6 per cent.), in which the urine contained no albumen, and in which, before the operation, no casts had been discovered. Among forty-six cases of non-albuminous urine, casts were found in sixteen cases after chloroform anæsthetization (34.8 per cent.), in which no casts were present before the operation. In most cases in which casts were present before the operation, the number increased after the anæsthetic, whether ether or chloroform was used. Of the thirteen patients who developed albuminuria after the narcosis, the urine of eleven contained casts also, usually in large numbers. Of the two remaining cases which showed no casts, one was anæsthetized with ether, and the other with chloroform.

The amount of ether employed in the cases in which albumen developed varied from 70 to 300 cubic centimetres, and the chloroform from 10 to 35 cubic centimetres.

The effect of the narcotization of children seemed not to be different from that of adults.

Twenty cases which had been given 100 cubic centimetres of

ether or more were tested by Trommer's method for sugar, with negative results.

Wunderlich makes the following deductions from his observations:

(1) An already-existing albuminuria is often increased by etherization. (No such case in which chloroform was administered has been observed by him.)

(2) Albuminuria can be caused by narcotization with chloroform and ether; but more often with chloroform.

The relative frequency with which it occurs after the use of chloroform and ether is as 11.5 : 6.9.

(3) As a result of chloroformization—less frequently as the result of etherization—casts may appear in the urine.

The relative frequency with which this occurs after the use of chloroform and ether is as 34.8 : 24.6.

(4) When casts are already present, both anæsthetics have the effect of increasing the number.

JAMES P. WARBASSE.

REVIEWS OF BOOKS.

THE JOHNS HOPKINS'S HOSPITAL REPORTS; REPORT IN GYNÆCOLOGY, II. Baltimore: The Johns Hopkins's Press, 1894.

This report contains nineteen articles, mostly contributed by Dr. Kelly. He reports a case of prolapsus uteri without vesical diverticulum and with anterior enterocele. In this case the protruding tumor consisted of uterus and intestines, the vagina being completely inverted, yet no portion of the bladder entered into the prolapsed sac. The operation consisted in the repair of a cervical laceration, followed by the removal of an oval piece comprising the whole thickness of the anterior vaginal wall, 4 x 5 centimetres, after which it was closed with a continuous catgut suture, buried and then superficial, thus having a linear wound in the axis of the vagina. Finally, the vaginal arch was lifted firmly up under the pubic arch by a symmetrical bilateral denudation extending well up into the sulci, using silkworm-gut and catgut for the closure. From information secured a year later it was learned that the patient was in good condition and had no prolapsus.

Another paper gives the literature of lipoma of the labium majus, Kelly having met with one case of this rather rare condition. He has tabulated twenty cases in all.

An article on deviations of the rectum and sigmoid flexure associated with constipation as sources of error in gynæcological diagnosis contains some valuable practical observations. Special emphasis is laid upon the fact that an abnormal disposition of the rectum and sigmoid flexure is especially prone to be associated with fæcal stasis.

"Operations for the Suspension of the Retroflexed Uterus" is the title of the paper in which Kelly gives an account of the operation for suspending the uterus. He justly objects to the terms

"hysterorrhaphy," "ventrofixation," and "hysteropexy," and prefers to use the more accurately descriptive term *suspensio uteri*. He recommends one of two methods,—first, by two ligatures of silk or silkworm-gut passed on either side through the peritoneum and subjacent tissue, two centimetres away from the abdominal incision and parallel to it, and then around each utero-ovarian ligament respectively, when they are tied, lifting the uterus up snugly into the anteflexion. The second method consists in passing two silk sutures through the peritoneum and subperitoneal tissue in a transverse direction and about 1.5 centimetres from the incision. The suture is then carried through a part of the body of the uterus or its posterior surface near the fundus and then through the peritoneum on the opposite side. The two ends of the suture are brought out of the incision and tied, bringing the uterus and anterior abdominal wall into closer apposition. A similar suture passed immediately below the first suffices to keep the uterus permanently in place.

In five cases he brought the uterus forward by shortening the round ligaments intraperitoneally. As this operation failed either in keeping the uterus in place or in relieving the suffering it was abandoned.

Kelly has performed the operation upon forty-five cases. Suspension alone was performed in twenty-three cases; other operations were performed at the same sitting in twenty-two cases. All of the cases recovered. One of the patients has since borne a child. In none of the cases in which the above operations were done has there been recurrence of the retro-displacement.

Dr. Mary Sherwood contributes a paper on the antiseptic power of potassium permanganate and oxalic acid.

A paper on intestinal worms as a complication in abdominal surgery is contributed by Dr. A. L. Stavely. He states that several remarkable instances of complications occurring in abdominal surgery through the presence of ascarides lumbricoides have been observed. A lumbricoid worm has thus been found provocative of such alarming symptoms following cœliotomy as to raise a question as to the ex-

istence of peritonitis or ileus. During a period of four months in 1891 six cases in the gynæcological department were complicated in this way. In five the parasite was *ascaris lumbricoides*, and in one *tænia mediocanellata*. The author gives also some interesting cases from the literature upon the subject.

Dr. Kelly continues with an article on the employment of an artificial retroposition of the uterus in covering extensive denuded areas about the pelvic floor. He applies this method in pelvic inflammatory disease in which the posterior surface of the uterus, the ovaries, and the tubes are matted together by dense adhesions, and in which the enucleation of ovaries and tubes is attended with injury to wide areas of peritoneum, on the pelvic floor, lateral and posterior pelvic walls, posterior surfaces of the broad ligaments, and posterior face of the uterus. In case of such an extensive raw area, if left to itself, the small intestine and omentum will in many instances gravitate downward, filling up the space left by the enucleation, and be detained by adhesions which may prove a constant source of distress to the patient after her recovery, or may even occasion a fatal ileus. The procedure consists in shutting off this space by fastening the rectum to the uterus by one or two sutures.

Mr. A. S. Murray has an article on photography applied to surgery, in which he gives the technique of this particular sort of photographic work.

An instructive case of traumatic atresia of the vagina with hæmatokolpos and hæmatometra is reported by Kelly.

Dr. W. W. Russell contributes a valuble study of urinalysis in operative cases. Two hundred cases in all were examined for casts, with the following results:

Number of cases containing			hyaline	casts	before	operation	. . 5
"	"	"	granular	"	"	"	. . 5
"	"	"	hyaline	"	after	"	. . 18
"	"	"	granular	"	"	"	. . 11
"	"	"	blood	"	"	"	. . 2

The urine for examination was drawn with a catheter. In forty-six (23 per cent.) of the two hundred cases albumen was found before operation. In sixty-six cases (33 per cent.) albumen was found after operation, an increase of 10 per cent. over the number before operation.

Dr. Hunter Robb has written upon the importance of employing anæsthesia in the diagnosis of intrapelvic conditions, to which he brings to bear an analysis of two hundred and forty cases.

A new method of resuscitation in choloroform asphyxia is described by Dr. Kelly. An assistant steps upon the table and takes one of the patient's knees under each arm, and thus raises the body from the table till it rests on the shoulders. The anæsthetizer in the mean time has brought the head to the edge of the table, where it hangs extended with the trachea and nasal cavity in a line. The patient's clothing is pulled down under the armpits, completely baring the abdomen and chest. The operator, standing at the head, institutes respiratory movements as follows: Inspiration, by placing the open hands on each side of the chest, posteriorly over the lower true ribs, and drawing the chest forward and outward, holding it thus for about two seconds; expiration, reversing the movement by placing the hands on the front of the chest over the lower ribs and pushing backward and inward, at the same time compressing the chest.

Kelly has collected statistics of one hundred cases of ovariotomy performed on women over seventy years of age. He himself has operated upon two such cases. The ages varied from seventy to eighty-two years. Eighty-eight of the hundred recovered. The nine cases from seventy-eight to eighty all recovered. His conclusions are that ovariotomy in the aged presents no essential differences from this operation in cases of younger years; and that the indications and contraindications for ovariotomy in the aged are essentially the same as for this operation in general.

Dr. Kelly gives a table of his abdominal operations for two years. An interesting feature is the extreme frequency of the use of

drainage in the earlier cases, and its almost complete abandonment towards the last. The glass drainage-tube has been given up altogether, and gauze is used in its place.

Finally, a record of deaths occurring in the gynæcological department is given. No critical review of the cases appears, but simply the statements of the post-mortem findings in the various cases.

There is running through all of these reports an accuracy of statement and a regard for mathematics that are certainly admirable. Such expressions as "a large amount of fluid," or "a tumor of moderate size," or "some distance from," and the like, unfortunately so common in our clinical reports, give place to accurate measurements in the work which it has just been our pleasure to review.

JAMES P. WARBASSE.

A TEXT-BOOK OF THE THEORY AND PRACTICE OF MEDICINE BY AMERICAN TEACHERS. Edited by WILLIAM PEPPER, M.D., LL.D. In two volumes, illustrated. Volume II, 1046 pages, 76 figures, 6 plates. Philadelphia: W. B. Saunders, 1894.

A synopsis of the general outline and scope of this valuable work was given in the review of the first volume (ANNALS OF SURGERY, July, 1893). Now that the second has appeared, it remains only for us to notice some of the special feature of this volume as well.

The opening chapter, entitled "General Considerations Concerning the Biology of Bacteria, Infection, and Immunity," by William H. Welch, is, like Dr. Billings's article, something of an innovation, especially in its attention to the minute details of these subjects so important in modern pathology. The author stands confessedly in the front rank of living investigators in this realm of science, and this chapter adds to his reputation as a writer and teacher. The portion of the chapter devoted to immunity and prophylactic and curative inoculations may well be regarded as

prophetic of a new era, just beginning, of practical prevention and cure of disease. Tetanus, diphtheria, and pneumonia will soon be ranked with small-pox in this respect, and the time seems near at hand when serum-therapy will in many diseases supplant the expectant treatment and the uncertain use of drugs.

Henry M. Lyman contributes a number of articles, those upon obesity, upon saccharine diabetes, and upon rheumatism being worthy of "honorable mention."

One of the most interesting and valuable sections of the entire work is that written by William Osler upon diseases of the blood. Besides the description of the gross appearances seen in Hodgkins's disease, leukæmia, and other blood diseases, Dr. Osler gives the methods of exact diagnosis by means of the preparation, staining, and examination of the blood itself so fully and so clearly that the practitioner will no longer be obliged to consult the elaborate treatises of Limbeck or Von Jaksch for a description of the technique of these procedures. The text is supplemented by well-executed colored plates, by photogravures, by cuts representing the forms of apparatus used, and by a colored plate showing the characteristic appearances of Addison's disease. Blood charts in colors are also given illustrating the careful methods of determining the exact number of red blood-corpuscles, of white blood-corpuscles, and of hæmoglobin employed by the best diagnosticians of to-day, as opposed to the diagnosis by guesswork, and the treatment of all alike by the use of Blaud's pills *ad libitum*, still too much in vogue. To a conscientious physician this chapter alone is well worth the price of the book.

Dr. William Pepper, to whose busy life as a practitioner is mainly due the deferred appearance of the book, has contributed largely to the work; 200 pages in the first volume and 325 pages in the second are from his pen. The diseases of the pericardium, myocardium, and endocardium, the neuroses, malpositions, and congenital affections of the heart, and the diseases of the blood-vessels are carefully and authoritatively presented, though it is to be regretted that the writer does not favor us with such minutiæ as to methods of diagnosis,

especially of physical diagnosis, as characterize Dr. Osler's article. Some plates or diagrams of the position of the heart and other organs in health and in disease, such as those in Wesener's book, would be of great assistance to the student.

An exhaustive and systematic discussion of the diseases of the mouth, tongue, salivary glands, pharynx, tonsils, œsophagus, stomach, and intestines is also by Dr. Pepper. Among the many sections worthy of note are those devoted to the methods of physical examination of the stomach, and to the chemical examination of the contents of that organ. The full-page photogravures of micro-photographs of the principal forms of tape-worms are among the best in the entire work.

The consideration of appendicitis is necessary to make the discussion of intestinal diseases complete; but, in view of modern results of surgical treatment when an operation is performed in the early stage of the disease, and the extreme gravity of the prognosis where it is delayed, Dr. Pepper might well have laid more stress upon the fact that medical treatment is uncertain and often causes dangerous delay, and that an early surgical operation offers to the patient the greatest number of chances of recovery.

Dr. James C. Wilson has written upon the diseases of the nose, larynx, bronchi, and pleura. The last named is the best of the series.

The articles upon the diseases of the liver and of the peritoneum are the best of those given by Reginald A. Fitz.

Practical urinary examination is the title of an article by J. W. Holland. The article in question offers many opportunities for adverse criticism. Many important forms of urinary deposit are omitted from the illustrations. Tests for indican, and the phenylhydrazin test, considered by most authorities to be the best test for sugar known at the present time, are not mentioned. No mention is made of the various forms of centrifugal machines by means of which urinary sediments can be collected and examined in a short space of time. The illustrations are few in number and are poorly executed

as compared with those in other parts of the book, and the chapter is by far the most unsatisfactory and incomplete in the entire work.

Diseases of the lungs and of the kidneys are Francis Delafield's contribution, and both articles are excellent. The charts showing the temperature, the pulse, and the respiration-curves in different colors on the same chart are especially good. Puerperal eclampsia is not discussed as fully as the importance of the subject demands. Less than a page is devoted to it.

The publishers are to be congratulated, as well as the editor, for the completion of so satisfactory a work, and may well take pride in the fact that the entire book, including the colored plates, is printed upon their own presses. The paper, type, press-work, and all the details of the work unite to form an excellent example of the book-maker's art. The first volume is already recognized as a standard book of reference, and the second volume more than realizes the expectations of the subscribers.

H. P. De Forest.

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CASES OF RUPTURED KIDNEY.[1]

By CHARLES K. BRIDDON, M.D.,

OF NEW YORK,

SURGEON TO THE PRESBYTERIAN HOSPITAL.

THE following cases have occurred during the last five years in my service in the Presbyterian Hospital.

CASE I.—D. P., aged forty years; builder; admitted November 15, 1888; nothing of interest in his previous history; ten days before he had fallen from a scaffold sixteen feet from the ground, striking upon his hands and left side; during this interval he had experienced sharp pain in the left side, and had passed bloody urine.

On Admission.—The countenance was pale and sallow, expression dejected; body emaciated; he complained of great pain and tenderness in the left lumbar region, which, on examination, presented a fulness and a sense of resistance. Temperature 101° F.; urine contained considerable blood.

The general and local symptoms increased, the hæmaturia persisting, the tumor in the loin and left hypochondrium increasing in size until the 28th, when an explorative operation was made.

A vertical incision was made outside the left erector spine four inches in length, passing over the convexity of the costo-iliac swelling, and was deepened through the perirenal tissues, which were found infiltrated with the products of inflammation. On opening the capsule of the kidney, there was a discharge of thin sero-pus mixed with blood-clots; further examination showed the capsule to be entirely dissected up by this fluid, and disclosed an irregular rent on the posterior surface of the organ. The wound was irrigated with a one-per-cent. solution of creolin, and dressed with a tampon of iodoform gauze. On the 29th the urine contained about the same amount of blood and pus.

December 3. No urine escaped from the lumbar incision that

[1] Read before the New York Surgical Society, February 28, 1894.

could be appreciated, and he passed sixty ounces per urethram, which contained some small amount of pus, but no blood. After this date the history was uneventful, and he was discharged with the wound entirely healed January 3, 1889.

CASE II.—Frank T., aged twenty-five years; laborer; Ireland; admitted December 2, 1890. Family history good; no inherited tendencies, and has always enjoyed good health.

November 16. While at work, he fell into a sewer-excavation, alighting on his right side. Shortly after being assisted out of the hole he went to work, and continued to do so for two weeks, though experiencing considerable pain of a dull aching character in the right flank just below the ribs. He noticed also during this time that his urine was of a dark-red color, and that much pain was experienced on voiding it.

November 30. In the evening, he was seized with acute lancinating pain in the right hypochondrium, and he had several severe rigors.

December 1. Felt somewhat easier, attempted to go to work, but was forced to return to his home and bed. His pain continued, coming on in paroxysms, localizing itself deeply seated in the right iliac region, and radiating upward and posteriorly; no hæmaturia.

December 2. He started out, and with considerable difficulty reached the hospital.

On Admission.—Patient was somewhat emaciated, countenance pale, expression anxious, temperature 100½° F., respiration 20, pulse 88. Pain, tenderness, and sense of resistance in right hypochondrium, and a distinct sense of resistance in right costo-iliac region, which was slightly prominent.

Hæmaturia was first noticed on December 3, and on the 4th it was noted "the urine contained so much blood that it coagulated on standing."

Up to this date we were quite in the dark as to the nature of the case, for the man had persistently denied having received any injury; and on the supposition that the kidney was the seat of trouble, an explorative incision was made, vertical, and to the outside of the right erector spine. The circumrenal fat and soft parts immediately adjacent were found infiltrated with products of inflammation and blood clot, and at last a cavity was exposed evacuating a quantity of bloody urine. The cavity was illuminated, and a thorough exploration revealed a deep transverse rent one and a half inches long

in the posterior surface of the kidney. The operation wound was thoroughly irrigated, and dressed with a tampon of iodoform gauze.

There was a clear urinous discharge from the incision, which, gradually diminishing, ceased by December 16, and the wound was entirely healed by January 14, when he was discharged, cured.

CASE III.—G. T., 48 years old. Longshoreman; native of Norway; admitted December 27, 1892. While walking along the river front he slipped on the ice, sustaining a fracture of both bones of the right leg. In falling his right lumbar region came in violent contact with a log of wood. He was brought to the hospital by ambulance, and was suffering considerably from shock; expression pale and anxious, extremities cold, pulse rapid and frequent; directly after admission he passed thirty ounces of urine of a dark-red color, specific gravity 1020, acid, 5 per cent. albumen, a large number of blood-disks, but no casts. As soon as he had reacted it was ascertained that his heart and lungs were sound, there was excessive tenderness and dulness in right lumbar and hypochondriac regions. His fracture was dressed, and he was made as comfortable as possible.

Pain and tenderness increased in right side, area of dulness extended upward to the under surface of the liver, and downward to a point below the crest of the ilium; his temperature went steadily upward until after the expiration of two weeks it had reached points varying from 102° to 104° F.

January 17. Condition was bad; had high temperature, perspirations, and bloody and offensive urine; bimanual palpation detected fluctuation in right costo-iliac space.

January 20. An incision five inches long was made along the outer border of the right erector spine. On dividing the deep lumbar fascia, a cavity was opened giving exit to a large amount of extremely fetid bloody fluid; the opening was enlarged to admit of thorough exploration, and it appeared to reach from the under surface of the liver above to and into the iliac fossa below. It was lined with more or less necrosed connective tissue, some masses partially detached and floating, others more or less attached. It was only possible with an excellent light to recognize a small portion of the posterior surface of the upper part of the kidney; the rest appeared to be fragmentary, broken down, hanging in shreddy masses. It might have been desirable to remove the whole, but any such attempt would have compromised the life of the patient, whose condition was sufficiently unpromising as it was. The wound was disinfected with peroxide of hydrogen, then

thoroughly irrigated, and dressed with a liberal tamponnade of gauze.

For a few days the man's condition was bad. The after-treatment consisted in careful alimentation and frequent irrigations with weak bichloride solution. The discharge from the operation wound was for some time serous and very fetid; but as sloughs were discharged this condition diminished; the wound then contracted rapidly, and it became evident that a large amount of urine was escaping. No estimate could be made of the quantity.

February 12. It was noted that the discharge from the bladder was between thirty and forty ounces. After that date the history was uneventful, the discharge of urine gradually ceased, the wound cicatrized, and he was discharged, cured.

CASE IV.—M. W., aged sixteen years; Bohemian. Grocer's boy admitted December 21, 1892. When crossing the street on the day of his admission, he was knocked down and run over by a two-wheeled wagon, one of the wheels passing over his abdomen. He immediately got up and proceeded on his way. After walking a few blocks he experienced an urgent desire to pass water, and he says that, after passing a little that was clear, the stream became of a dark-red color. On reaching home he went to bed, passing bloody urine at intervals of a few hours, and vomiting whatever he took until 10 P.M., when he was brought to the hospital.

Patient somewhat pale, but otherwise well nourished. Examination of thoracic viscera negative. No external marks of injury. Right side of abdomen slightly tympanitic; left side is tender on pressure, as is also the corresponding costo-iliac space; the muscular wall is rigid, comparatively dull on percussion, and bimanual palpation detects a mass without any defined margin. Temperature 99° F.; respiration 20; pulse 72; urine dark-red; specific gravity 1015. Large amount of blood disks; no casts. There being some doubt as to the source of hæmorrhage, four ounces of urine were removed by catheter. Eight ounces of Thiersch's solution were then injected, the whole of which returned in a clear and large stream.

The treatment consisted in the application of ice to the renal region, daily irrigation of the bladder, and a bland fluid diet. Under these means his temperature never rose above 101° F.; the tumor and tenderness in the hypochondrium gradually disappeared; the hæmaturia diminishing until January 12, when none was found, and he was discharged, cured, on the 15th.

Remarks.—All of these were cases of rupture of the kidney itself without involvement of the peritoneal investment. In three of them the diagnosis was verified by the operations that were considered necessary in the treatment, and no doubt was entertained but that similar but less extensive injuries existed in the fourth.

With regard to the symptoms, I do not regard any single one as sufficient, but a complex of several of those present will generally determine the matter. First may be considered the character of the injury. Nearly if not always they are the result of direct violence done to the hypochondrium or ilio-costal space. In one of these, the man fell from a scaffold striking upon his left side; in the second, the man fell into a sewer-excavation, striking on his right side; in the third, a wagon passed over the abdomen; and in the fourth, the patient fell on the ice, his lumbar region coming in violent contact with a log of wood.

Secondly. The presence of hæmaturia existed in every case; in the first, lasting from the time of infliction of the injury until the operation was done, thirteen days; in the second, the urine was clear when admitted, but on the second day was so charged with blood that it coagulated on standing; in the third, it was a prominent feature for twenty-three days; and in the fourth, it was present during twenty days.

Of course, it is well known that hæmaturia is a symptom of various morbid conditions of the kidney and bladder, but the history will eliminate such cases, and it may be absent in the lesions under consideration. In those very severe cases in which there is laceration of the peritoneal investment, both blood and urine may all pass into the cavity of the peritoneum, or the injury may be associated with complete laceration of the renal vessels. Under such circumstances, if the supply of blood is entirely shut off, you can have no secretion of urine from the kidney involved. In the less severe ones, those fragments that are supplied with blood will go on secreting; and if the ureter is patent, the fluid will pass on, and into the bladder; if the ureter should be obstructed by a clot, secretion will go on until the pressure in the uriniferous tubules exceeds that in the renal glomeruli, when it will cease until the equilibrium is restored.

With regard to the third sign, the presence of tumor, it will probably not be found when laceration of the serous investment complicates the case, as in such grave conditions it is probable that the extravasated fluids will be found free in the peritoneum. In the milder cases, where such extravasations are walled in by a layer of condensed connective tissue, it will not easily be made out until the tenderness and resistance of the muscular walls have subsided; but this very resistance itself, associated as it always is with exquisite sensitiveness, will constitute a symptom little less significant than tumor itself.

Treatment.—In the cases of moderate severity will be mainly expectant; absolute rest, a bland fluid diet, and the application of ice compresses, will frequently carry them through to a successful issue.

If septic processes should ensue, initiated by rigors, perspirations, and elevation of temperature, prompt action must be taken; a lumbar incision, irrigation, and drainage of the infected cavity.

In those cases in which there is laceration of the peritoneum, generally the result of more severe injuries, and which are rarely recognized until an abdominal section is made in search of the cause of acute anæmia, suspected to be due to internal hæmorrhage, I believe the indication is in most cases to supplement the section by nephrectomy.

REPORT OF THREE CASES OF GANGRENOUS HERNIA SUBJECTED TO CIRCULAR ENTERORRHAPHY.[1]

By A. J. McCOSH, M.D.,

OF NEW YORK,

SURGEON TO THE PRESBYTERIAN HOSPITAL.

WHEN a loop of the small intestine has become gangrenous from strangulation in a hernial sac, what plan of treatment shall be adopted? Is it safer to form an artificial anus or to do a resection and immediate suture? If an anus be formed, a secondary operation, and one attended by considerable danger, will be necessary, provided death from inanition does not ensue before the opening can be closed. Immediate enterorrhaphy, on the other hand, is unattended by either of these dangers, but the operation in itself must necessarily be lengthy and serious, and in many cases its performance will be impossible on account of the desperate condition of the patient.

In reporting a case a few years ago, I collected 115 cases of immediate enterorrhaphy, and found the mortality to be about 50 per cent. In spite of this large death-rate, my own preference in the majority of cases is for immediate suture, instead of the formation of a temporary artificial anus.

The three cases reported comprise my entire experience, and the satisfactory results obtained have no doubt largely influenced me to favor the immediate closure of the intestinal canal whenever the patient's condition does not contraindicate this procedure.

For the purpose of uniting with safety and rapidity the divided ends of intestine, many ingenious devices have in recent years been introduced. It seemed for a time as if some of them might replace the old method of end to end suture. They have

[1] Cases reported at the New York Surgical Society, February 28, 1894.

not, however, stood the test of time, and most of the rings and plates have had their day. In exceptional cases they may still be useful, but I feel that under ordinary circumstances there is no need of them. It has always seemed to me that the union of the divided ends of the small intestine could be best accomplished by sutures alone without the aid either of lateral anastomosis or of rings. I have always adopted this method, and the results have not made me regret the omission of artificial aids. In the three cases reported, union has been perfect, and no contraction of the intestinal calibre has followed. In one case nearly six years have elapsed since operation, and the patient has regular, well-formed, fæcal evacuations. In another, three years have elapsed without any sign of constriction. It may be too soon to judge of the third case, but thus far he has no sign of obstruction or even of constipation. One of these cases has already been reported,[1] and I shall only briefly refer to it:

CASE I.—Male, aged twenty-five years; had always been a strong, healthy youth. For four years a right inguinal hernia had existed, for which he had worn a truss. He was admitted to the Presbyterian Hospital on the evening of December 29, 1893. Three days previously he had failed to wear his truss, and the hernia had at once bulged down into the scrotum, and became irreducible and painful. An attempt was made to reduce it by taxis, but it was unsuccessful. On the next day the tumor became more tense and painful, and he began to vomit. On the morning of December 29 the vomiting became stercoraceous, and another unsuccessful attempt was made by his physician to reduce the hernia, the patient being under the influence of ether for nearly an hour. The stercoraceous vomiting continued, the temperature became subnormal, and the pulse was very weak and rapid. On his admission to the hospital, he was almost in collapse, and his vomiting, stercoraceous in character, was almost constant. I first saw the man at 10 P.M., and decided on immediate operation. In the right side of the scrotum running up to the inguinal opening was a tense tumor, without impulse on cough, as large as a cocoanut. Chloroform was administered and an incision made down to the sac, which was distended with a blackish fluid. On opening the sac, dark blood, partly fluid and partly clotted, to the

[1] New York Medical Journal, March 16, 1889.

amount of about ℥ x, gushed out. In the sac was seen a loop of small intestine, about seven inches long, of a dull brown color without gloss, and on its wall were two or three blackish spots. The mesentery of this loop was distended by a solid mass of semiclotted blood as large as the adult fist. It was partly this clot, situated between the layers of the mesentery, and partly the constriction in the inguinal canal which had cut off the blood-supply from the intestine, and the result was partial gangrene. The incision was carried upward, and the abdominal cavity freely opened. I decided to excise the gangrenous loop and at once suture the intestinal ends together. The patient's condition seemed to warrant such a procedure. The intestine appeared healthy at points three inches beyond the furrow caused by the constriction. A narrow strip of iodoform gauze was passed through the mesentery and tied, thus occluding the calibre of the gut. About twelve inches of intestine were then excised, the proximal ends being held by an assistant. A portion of mesentery, including the space in which was the hæmatoma, was also excised. The bleeding was controlled by artery clamps, and was not excessive. The ends of the gut being approximated by my assistant, they were united by three rows of sutures. The sutures of very fine silk were interrupted and were threaded in an ordinary round cambric needle. The first row passed through mucous membrane alone; the second through all the coats; and the third were Lembert sutures through the serous coat alone. A few sutures united the gap in the mesentery. No ligatures were used. The intestine was washed and returned. The upper part of the abdominal wound was sutured, the lower part was left open, and a narrow strip of iodoform gauze passed into the peritoneal cavity. The sac was left *in situ*, and was packed with gauze. The operation lasted about an hour and a half. At its end the patient was in collapse, but soon rallied. The vomiting ceased at the end of ten hours. For forty-eight hours nothing was given by stomach, but rectal enemata were administered regularly and retained. On the fourth day he was given beef extract, and on the fifth milk by the stomach. The bowels moved on the sixth day. On the eighth day the gauze was removed. It was perfectly sweet, and there was no sign of leakage. The wound was repacked with gauze, which, however, did not enter the abdominal cavity. On the eighteenth day the patient was etherized, and a secondary suture of the lower part of the abdominal and the scrotal wounds was performed, and union resulted. The patient was out of bed on January

25, and was discharged cured on February 9, with a wound perfectly united, and while the cicatrix does not appear very firm, there is no sign of hernia. The patient is well, complains of no pain, and he has regular, well-formed, fæcal movements.

CASE II.—Mrs. L., aged forty-three; had been operated on by me in 1889 for tubercular peritonitis. Laparotomy was performed, and apparently a cure had resulted without any tendency to hernia through the cicatrix.

December 12, 1891. I was summoned by Dr. Paine to see the patient and to operate upon a strangulated hernia. The presence of a right inguinal hernia had not been suspected until three days previous to my visit, when she began to vomit and to complain of pain in a lump situated in the right groin. Her bowels had not moved for five days; the vomiting had continued for three days and for the preceding twelve hours had been stercoraceous. The patient was in rather a desperate state, pulse 120, and very feeble; temperature 98° F. Skin cold and clammy, and mental state very stupid. In the right inguinal region was a boggy red swelling which had more the appearance of an abscess than of hernia. Immediate operation was demanded, and I deemed it unwise to wait for further assistance or preparation, and therefore the operation was begun and completed with the aid of Dr. Paine and a trained nurse. It was considered safest not to administer an anæsthetic. The patient was so stupid from morphine and sepsis that she made but little resistance.

Cocaine was injected and an incision was made into the mass, from which escaped a considerable amount of foul pus and exposed a black hernial sac. On opening this, several ounces of blackish, stinking fluid and gas poured out, and in the sac was seen a loop of small intestine, perhaps eight inches in length, of a dark-brown color entirely without lustre. In it was a small opening through which gas had already escaped. The entire loop was so rotten that gentle manipulation tore a large rent in its wall. It was a question whether immediate resection and suture or a temporary anus would be the surest course. So far the patient had lost no ground during the operation, which had consumed but a few minutes. I decided therefore to freely open the abdomen, and if healthy intestine were found near the gangrenous loop to perform immediate suture. The gangrenous intestine was carefully drawn a considerable distance outside the abdominal cavity after carefully dividing the stricture in the inguinal canal. A large amount of gas and fluid poured out. From

the appearance of the intestinal contents, it was evident that the opening was in the beginning of the ileum, a strong argument in favor of enterorrhaphy. The gangrenous loop was wrapped in a wet bichloride towel, and the abdominal opening enlarged so as to admit two fingers and permit free inspection of the cavity. At points about four inches beyond the deep furrows caused by the constriction, the gut seemed to be healthy, and it was here divided so that about fourteen inches of intestine were removed with a small portion of mesentery. There was but little hæmorrhage, which was controlled by a few clamps. The cut ends of the intestine were then approximated and united by two rows of interrupted silk sutures, threaded in ordinary round cambric needles. The first row passed through all the coats of intestine. The outer row consisted of Lembert sutures passed through the serous coat alone. A few sutures united the mesentery. The intestine was washed off with hot bichloride solution and returned into the abdominal cavity. The abdominal wound was partially closed, the lower half being left open, sutures having been inserted on each side, but not tied. The sac was left undisturbed and packed with bichloride gauze. The operation lasted fifty-five minutes. In spite of free stimulation with hypodermic injections of digitalis and whiskey the patient, when removed off the table, was in a state of collapse, pulse 160. During the following twelve hours her condition was critical. Her vomiting, however, gradually ceased, and at the end of ten hours she was able to retain whiskey by the mouth. On the third day she was given beef extract, and on the fourth peptonized milk. Her bowels moved on the fourth day.

Temperature on the second day rose to 103° F., but soon fell below 100° F. The wound was dressed on the fifth day and found to be somewhat septic. It was repacked with iodoform gauze after irrigation. On the tenth day it was redressed and found to be healthy. The sutures inserted into the lower half of the abdominal opening were then drawn together, closing the peritoneal cavity. There resulted a perfectly solid union with no return of the hernia. The patient's convalescence was slow and she was not out of bed till the fifth week. She is now a healthy-looking woman and, in spite of the two abdominal scars, is able to do heavy house-work. She suffers no more from constipation than she did before the operation, and the fæcal movements are large and well formed. When the interior of the abdomen was inspected by touch and by sight, it was both interesting and gratifying to discover that not the slightest trace of the

tubercular peritonitis remained. Two years before the entire peritoneum, both visceral and parietal, was roughened, and masses, probably enlarged glands, were present along each side of the spinal column, varying in size from a pea to a hickory-nut, and in the pelvis was a mass as large as a walnut. These had entirely disappeared.

CASE III.—Female,[1] aged sixty-six, Strangulation had existed for forty-eight hours. The patient was in fair condition. The operation was done June 5, 1888. The sac contained foul-smelling fluid. A loop of intestine, three inches long, was gangrenous. The gut was drawn outside the abdomen and divided at points where it appeared healthy. The intestine was occluded by the fingers of an assistant, and the ends approximated. No constricting ligatures or clamps were used. The ends were united by two complete and one partial row of sutures. The inner consisting of interrupted silk sutures passed through the mucous membrane alone. The middle consisted of Lembert sutures of catgut passed through the serous and muscular coats. The outer, which was partial, consisted of Lembert sutures. The intestine was returned, the sac extirpated, and the wound sutured. Time of operation, eighty minutes. For forty-eight hours no food was given, on the third day beef extract, and on the fourth day milk was allowed. On the fifth day the bowels moved. The patient left the hospital at the end of four and a half weeks. She has been well ever since. In spite of her seventy-two years, she is still active. She experiences no trouble with her bowels. The movements are large and well formed. She has no pain and no return of the hernia.

The plan of suture in these three cases has been similar. In two of the cases three rows and in one patient two rows have been employed. The result has been the same, and, in future, I should feel inclined to omit the separate suture of the mucous membrane and rely on two rows, the inner through all the coats, and the outer (Lembert) through the serous coat alone. The sutures have always been interrupted. Intestinal clamps have not been employed, as the fingers of an assistant answer every purpose. The patients were nourished entirely by the rectum during the four or five days following the operation, and they gained strength rapidly under this form of alimentation.

[1] New York Medical Journal, March 16, 1889.

FRACTURE OF THE LOWER JAW WITH SEPARATION OF THE GENIAL TUBERCLE.

By GWILYM G. DAVIS, M.D.,

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A YOUNG man, aged twenty-six years, was admitted to the German Hospital with a history of having fallen, while drunk, and struck his chin against the curbstone. On examining him a wound about an inch and a half long was found on the under surface of the chin. Just to the left of the angle of the mouth was another wound an eighth of an inch long. Three of the lower incisor teeth were knocked out, and there were two openings through the mucous membrane. The jaw was evidently fractured through the symphysis, and so much comminuted as to necessitate its fixation in some manner.

Anæsthesia was begun with ether, but he took it badly and commenced to choke at once. Chloroform being substituted was attended with no better result, the patient getting blue from asphyxia. A stout silk ligature was then passed through the tongue, and the latter firmly dragged out and held, protruding at one corner of the mouth. This improved matters very much, but did not obviate the difficulty entirely.

At this time I regarded the difficulty experienced in administering the anæsthetic as being due simply to the patient not being a favorable subject for its administration, as not infrequently occurs.

In order to fix the fragments, a thick silver wire about a twentieth of an inch in diameter was passed between the sound molar and bicuspid teeth on the right side at their junction with the gums, the space being slightly enlarged with a drill. It was then carried toward the opposite side, crossed where the teeth were missing, and passed between the sound canine and premolar teeth, and the ends twisted in front and cut off close. This fitted the remaining teeth neatly, but not being firm enough it was fastened in place by three loops of

ordinary silver suture-wire, passed through holes drilled in the bone a quarter of an inch below and then brought forward over or between the teeth, and one turn taken around the thick wire and the two ends twisted and cut close. This formed a fairly-firm splint, but still hardly secure enough. Passing to the opening beneath the jaw the soft parts were pushed up out of the way, and thick wire passed through the two lateral fragments, drawn tight, twisted, cut close, and firmly clamped on the bone. Some loose fragments were removed, and a V-shaped piece from the lower portion of the bone found to be lacking. The fracture had begun above in a single line at the incisor

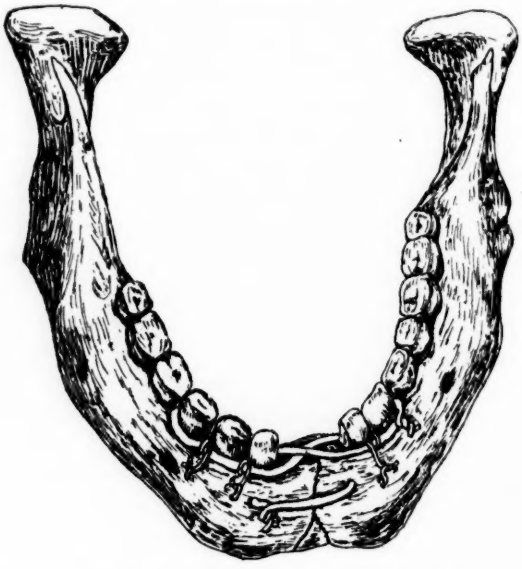

FIG. 1.—Showing lines of fracture and the method of suturing.

teeth and branched below, like an inverted letter Y (λ). On passing the finger back the missing piece was found pulled close down to the hyoid bone. Grasping it with the finger and drawing it forward caused the patient at once to breathe easier, and it was no longer found necessary to drag the tongue forward. This piece was brought up and sutured in place with silkworm-gut. The wound was washed out well and, going back to the mouth, two openings in the mucous membrane were sutured shut with catgut. The external wound below the jaw was sutured, and drainage employed for twenty-four hours. The progress of the case was very satisfactory. The mouth,

by the use of detergent lotions, was kept perfectly clean, and there was none of the foul condition that so often complicates wounds of that region. The small opening in the cheek discharged a spicule of bone which had been detached from the under surface of the symphysis, and had evidently been thrust there at the time of the injury and escaped notice, and then at once healed. The wound beneath the jaw closed by primary union, except a small sinus leading to the lower wire suture. At the end of the fifth week union was firm, and the wire around the teeth was removed. Five weeks later the patient returned to the hospital, and the resident physician removed the lower wire, soon after which the sinus closed.

This case was of interest to me because of its rarity. It is the only one of the kind I have had in an experience of at least three or four dozen fractured jaws, and I know of no exactly similar case.

The only reference I have seen or can find to the subject is that which Stimson gives in his "Treatise on Fractures," p. 287. The case referred to was recorded by A. L. Peirson. In the *American Journal of the Medical Sciences* of 1841, p. 186, will be found a review written by George W. Norris of "Remarks on Fractures," by A. L. Peirson, M.D., 1840. In this review is quoted the following case which occurred in Dr. Peirson's practice:

> A wagoner was crushed by the passing of the wheel of his loaded wagon over the lower jaw. A double fracture was occasioned, and the detached portion of the bone with the tongue was forced down the throat, so as to nearly occasion suffocation. The accident occurred in the night, but, fortunately, near a house whose inhabitants were awake; and the patient obtained the loan of an iron spoon, with which he contrived to drag the tongue forward, and prevent the impending suffocation, till I was enabled to secure the fragments by wiring the teeth. Great swelling followed, preventing deglutition for many days; but the patient being supported by an œsophagus-tube eventually recovered.

The phenomena of suffocation in my case were caused by the muscles attached to the fragment, the genio-hyo-glossus, genio-hyoid, and probably the digastric, pulling it back and down into the throat.

In order for this suffocation to be produced, it is necessary for these muscles to be detached from the jaw, either taking with them or not a piece of bone. The detachment of the muscles attached to the symphysis in operations on the tongue and jaws has been well known by surgeons to allow falling back of the tongue. Magendie is said to have lost a case from this occurrence, and when it takes places in cases of fracture the violence must have been great enough to thoroughly loosen them. Double fractures of the jaw, one occurring on each side of the symphysis, ordinarily are not accompanied by this difficulty, and the reason is that the muscles remain attached to the middle piece, and the latter is retained in position by its attachment to the lateral bony fragments by the soft parts. I know of a case in which the fractures passed through the neighborhood of the canine teeth, and yet the displacement was very slight. When, however, as in Peirson's case, we have the median fragment torn by the violence away from the surrounding parts, and remaining attached only by the tongue and hyoid muscles, then the latter retract it at once, and suffocative symptoms appear.

My patient as long as he remained perfectly quiet had no trouble, but as soon as the tongue was disturbed suffocation ensued. The clean condition of the mouth, and absence of suppuration in such a dirty wound communicating with it, is accounted for by the two openings in the mucous membrane having been sewed shut, and thus preventing the secretions of the mouth from infecting the wound, and preventing the wound from pouring fetid pus back into the mouth. The value of the procedure was so marked here as to lead me to suggest its being more generally used in cases of common fractures in which the mucous membrane has been torn, and communication established with the seat of fracture.

The wire splint around the teeth first applied fulfilled its purpose admirably. As soon as completed, the continuity of the jaw was established with a very fair degree of firmness. In these cases of bad fractures of the jaw some means of fixation must be employed, and the question of interdental splints comes up. That good results can be obtained with them is undoubted, but they require to be made at some subsequent period by a dentist.

Even Hammond's wire splint, in use in Guy's Hospital and praised by Bryant, requires to be made over a plaster cast. The after-treatment of a case with interdental splints is more troublesome and disagreeable to the patient than is wiring, and as the latter procedure is one which the surgeon himself can carry out and apply when he is first called to see the case, and as it fulfils the object desired, I prefer it in many cases. The satisfaction to be derived from its use depends on the mode of employment. If a case has enough sound teeth to permit the use of a wire splint, I think one can be applied by the surgeon himself at once. One of the main points to be observed is to use a very thick wire. It should be used not only to avoid the fragments being parted from each other, but also to prevent lateral displacement, and this the rigidity of a thick wire does. It can hardly be necessary, as has been suggested, ever to drill a hole through the teeth; simply reaming out the natural space between them, in order to enable the wire to be passed through, is all that is required. It can then be bent into shape to fit the teeth as closely as possible, and the posterior end brought in front, pulled tight with a pair of forceps, and the two ends then twisted. The three stays applied kept the wire around the teeth firmly in place. In this manner a perfectly serviceable wire splint can readily be made. When it is desired to remove a wire that is buried in the tissues, as was the case with the lower one introduced through the wound beneath the jaw, this can be readily done, as it was in this case, by slightly enlarging the sinus, cutting the wire on one side of the knot with a scissors, and grasping the knot, wind the wire around the end of the forceps until it is removed.

GASTRO-ENTEROSTOMY WITH BONE PLATES.

By KNUT HOEGH, M.D.,

OF MINNEAPOLIS.

THE following case may deserve to be put on record, as it shows the value of Senn's bone plates in gastro-enterostomy; my conviction is that they are the best means we as yet have for the performance of this operation, especially better than Murphy's button.

In a man of forty-three years, H. O. H., of Martell, Wis., there had been diagnosticated a malignant tumor of the stomach, the diagnosis resting upon grave digestive disturbances, including pain after eating, vomiting of undigested, foul-smelling food in large quantities, wherein numerous micro-organisms, including sarcinæ ventriculi, and indicating dilatation of the stomach, and upon the presence of a swelling of progressive growth in the epigastrium, upon steadily increasing pallor and emaciation with loss of strength, and upon the absence of hydrochloric acid in the stomach contents after Ewald's test-breakfast, the contents neither turning congo-paper blue, nor giving the characteristic rose-color with Günzburg's test.

The diagnosis and bad prognosis being communicated to the patient in obedience to his expressed wish, he refused operative interference, and he was, after a few days' washing out of the stomach by means of siphonage, sent home, taking with him a stomach-tube, to continue the washings at home. In some way he broke his tube on his way home, and he returned in a week, when his stomach was found to contain between six and eight quarts of decomposing contents; when at home he had had no passage by the bowels, and his strength had declined to an alarming degree. It was evident that the tumor completely occluded the pyloric opening, and that life could not last many days under the present conditions.

Under these circumstances the patient elected to have gastro-enterostomy performed.

With the kind assistance of J. C. Stewart, M.D., the operation

was performed November 11, 1893, at St. Mary's Hospital in this city. Owing to the unexpected large size of the tumor, the stomach was much more displaced towards the left than was anticipated, which led to a false step being taken, the tumor being supposed to be the stomach and partly incised; this produced a troublesome hæmorrhage, which it took a very long time to stop. After this had been carefully done, the stomach was found, and the operation of uniting it with the upper part of the jejunum by means of large (three and a half inches) bone plates, with liberal openings, was easily and rapidly performed. The bone plates had been kept in moist condition to prevent their producing gangrene, by compressing the visceral walls from their swelling on imbibing fluid. The patient vomited some blood after the operation, but had no other unfavorable symptom, neither fever, abdominal pain, tympanites, nor obstruction. For the first few days he was sustained exclusively by nutrient enemata;[1] after three days he was given broths, peptonized milk, and corn-starch pudding. These articles of food being easily digested, the diet-list was gradually increased. The patient made an uninterrupted recovery, and went home in three weeks.

I received a letter from him dated January 11, 1894, in which he expressed his satisfaction with having undergone the operation; he can now eat and digest, suffers occasionally slightly from nausea, but is on the whole in a satisfactory condition.

The bone-plates were not vomited, nor found in the fæces, although carefully looked for.

I compare this case with two cases of enterostomy that I know of in my neighborhood, and within my circle of acquaintances, where Murphy's button was used. Both cases died, the one was well for some days, when sudden fatal peritonitis developed, the other died after about one day. The surgeon was a man of exceptional skill, so that, I presume, no technical fault was committed.

Three serious dangers have been indicated as connected with the use of Murphy's button, and I enumerate them in their supposed order of importance.

[1] The nutrient enema, which I have used in many cases with good result, consists of one ounce of glucose boiled with one drachm of flour, and five ounces of water; after this has cooled there is added a half ounce of claret and two eggs beaten up with a half ounce of water.

(1) The margins of the button are supposed to, and really do, produce pressure gangrene, thus opening a source of infection whose limits are unknown, and not within our control.

(2) A foreign body of the size of these buttons has repeatedly produced intestinal obstruction in cases that have come to my knowledge, notably a case of gall-stone.

(3) The plane of juxtaposition seems to be too small in extent to produce sufficient adhesions.

In favor of the button has been urged the rapidity of its insertion and its small size.

I believe that Senn's bone-plates can be placed with the same ease and rapidity ; that their size is of no importance, because they soon become softened and macerated ; that they produce sufficiently large surfaces of adhesion ; that they, properly prepared, —moist,—produce no gangrene.

TWO CASES OF LAMINECTOMY FOR FRACTURE OF THE VERTEBRÆ WITH COMPRESSION OF THE CORD.[1]

By E. P. RIGGS, M.D.,

OF BIRMINGHAM, ALA.

PERFECT cleanliness in the management of operative wounds has made it possible to invade regions of the human organism that were hitherto regarded as totally inaccessible by even the boldest operators. The results of operations upon the spinal cord or its membranes for disease or injury prior to antisepsis were so discouraging that it was abandoned by nearly all surgeons. A successful case reported by Dr. Macewen, of Glasgow, in 1888, marked the beginning of a new epoch in this particular field of the surgeon's art. Recently, Dr. William White, under whose hands mainly the modern operation was evolved, has made an excellent report of quite a number of successful cases. His results, together with a number of cases reported by others, go to show that extensive resection of the lamina may be accomplished without materially impairing the strength or utility of the spine. That, under modern antiseptic precaution, the danger of consecutive inflammation of the cord and membranes is no longer to be feared. That hæmorrhage is not difficult to control by moderate and prolonged pressure. That the escape of spinal fluid is not a very serious complication. Then, the only ground for objection to operative interference in injuries from traumatism is the difficulty of determining accurately the nature and extent of the damage to the cord. Because of the comparative safety of the operation, the low mortality following it, and because of the fact that, in a large proportion of the recorded cases, fracture of the posterior arch or a dislocation existed, and that, too, when there was no deformity or

[1] Read before the Southern Surgical and Gynæcological Association, 1893.

other positive evidence of the condition, I cannot avoid subscribing to the opinion that the doubt should weigh in favor of, rather than against, an operation. It is well that it should be borne in mind that these cases nearly all die when treated expectantly or by extension. And, therefore, the rule formulated by Lauenstein,—namely, "that several weeks should elapse to allow nature's unaided effort to attempt repair," should no longer be regarded as a warrantable surgical procedure. The best results are to be expected only when the operation is made immediately after the injury. To sit quietly by in the soft shadows of providence with these cases, and allow them to run their course before relief by operation is attempted, is not in conformity with the teaching of modern and progressive surgery.

In the early part of June, 1893, I assisted Dr. Wyman, of Birmingham, in operating on a negro miner, who had received a spinal injury, eight weeks previously, while digging coal, which produced complete paralysis of both motion and sensation below the distribution of the last dorsal nerve. There was incontinence of urine with purulent cystitis and no control over bowels. The sloughs were very extensive and the patient's body extremely offensive. The fractured and depressed lamina of the second lumbar was removed and the cord found completely atrophied and disorganized. Of course no hope of a beneficial effect was entertained. The man died about fifteen hours later.

The following day I operated on A. G., who had been injured four days before in the same manner as the case just reported. He also was completely paralyzed, with the usual bladder and rectal symptoms. An examination revealed considerable tenderness over the last dorsal and first lumbar vertebra, with a noticeable separation of the spinous processes without marked lateral deviation. I operated according to the method advised by Dr. White. After separating the tissues on each side of the spines and exposing the arches by means of stout, broad retractors, it was perfectly apparent that fracture had occurred through the lamina, close to the spinous process on one side and luxation with fracture through the articular process of the opposite side of the last dorsal. Thus the posterior arch was almost completely detached and was driven down and pressing upon the cord. I removed this fragment together with the posterior arches of the

vertebræ above and below. The membranes were greatly lacerated and the cord intensely congested. A free oozing was soon controlled by a moderate pressure with iodoform gauze. A small drainage-tube was introduced and the wound closed by deep catgut and superficial silkworm-gut sutures. The cerebro-spinal fluid continued to escape for two weeks after the operation, when the wound healed. There was no discomfort whatever attributable to the operation. Small sloughs formed over each trochanter major about ten days after the operation, but began to heal very soon, and in a few weeks were entirely well. At the end of the fourth week the patient could move each foot slightly and sensation had extended to the knees. Since that time the improvement has progressed but little. I am now convinced that a displacement of the body of the vertebræ existed and the compression was only partially relieved. I believe it would be good surgery to attempt to reduce the luxation by direct means before the laminæ are removed. This might be successfully accomplished by grasping the spines above and below with stout, flat forceps and the leverage thus obtained,—and by at the same time extending the body,—the vertebræ can be guardedly forced into place, when a plaster-jacket applied would retain its position.

These cases seem to me to warrant the following conclusions: (1) That operations for spinal injuries should be done *immediately* after the accident.

(2) And when luxation has occurred, its reduction should be attempted by guarded but forced manipulation directly applied to the vertebræ themselves.

REPORT OF TWO CASES OF LAMINECTOMY, WITH A TABULATED COLLECTION OF FIFTY-TWO CASES OF LAMINECTOMY OF RECENT DATE.

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OF WASHINGTON,

RESIDENT PHYSICIAN, EMERGENCY HOSPITAL.

OF the two cases reported below, one demonstrates in the highest sense the good results of such operation, and the other shows the typical course of spinal fracture with paralysis unrelieved by operation, but with subsidence of pain and the absence of any indication of the fatal issue impending.

Both operations substantiate the fact that laminectomy in recent injuries of the spinal column, causing compression of the cord and its associate symptoms, is a justifiable operation. The severe hæmorrhage spoken of by some authors as a particular danger in the performance of laminectomy was not experienced in either of these cases.

The laminæ in both cases were removed by means of large angular bone forceps, and the periosteum was preserved as much as possible. Chloroform was the anæsthetic used in each. I am indebted to Dr. Jas. Kerr, my chief, for permission to report these two cases.

CASE I.—Willis W., aged twenty-two years, colored, laborer, born in Virginia. He was brought into the hospital in a patrol-wagon at 4.30 A.M., November 22, 1893, suffering from a bullet-wound of the spine. On examination, a small external wound was found over the region of the last dorsal vertebra. Sensation was intact, but motion completely lost from the hips down. He complained of excessive pain, more particularly referred to the legs. This was about an hour after the injury. Subsequently during the day sensation from the knee to the toe was lost and all the lower reflexes abolished. His wound was dressed with bichloride gauze, and his condition of shock

was treated by stimulants and external heat. Morphine sulphate was given to alleviate his intense pain, which at the time was attributed in great part to his excited mental condition. Both bladder and bowels were paralyzed. His pain continuing and the paralysis progressively extending, at 3 P.M. of the 22d, laminectomy was done, such operation being deemed advisable, as the progressive symptoms indicated pressure on the cord. The spinal column was exposed by a linear incision over the region of the wound. The periosteum was separated, and portions of three laminæ were removed. The canal, thus opened, was explored for the bullet. A piece was found loose in the canal and removed, having entered between the laminæ of the twelfth dorsal and first lumbar vertebræ. The cord presented a rather contused appearance, and was split in the middle. There was some extravasation of sanguineous fluid into the canal, but no direct evidence of a spinal hæmorrhage of any importance. The wound was irrigated with sterilized salt solution at about a temperature of 100° F., and closed by means of a full-curved Hagedorn needle with deeply-buried sutures, and a superficial subcutaneous suture after the manner of Halstead. A catgut drain was inserted, and iodoform gauze was laid over the wound, and over this was placed the ordinary covering of sterilized gauze and cotton.

Catheterization was ordered every six hours, and on the third day his bladder was washed out with a solution of boracic acid. This washing was continued daily until January 1. His temperature rose to 101.6° F. after the operation, but remained within a few points of the normal until December 27, when it rose again to 102° F. This elevation was apparently of no significance as the temperature fell on the following day. His pain disappeared immediately after the operation, and, with the exception of a few paroxysms, has been eliminated ever since. Sensation gradually returned, until now it is complete. Motion was first noticed about November 29, seven days after the operation. The first manifestation was movement of the sartorii. Gradually the motion was restored in the right limb, and he now has fairly good use of it, considering the length of his confinement. The left leg is still paralyzed, with the exception of the thigh movement of the sartorius and some motion in the foot.

The urine has remained normal throughout. A median cystotomy was done, and a catheter left *in situ* for over six weeks. This procedure was demanded owing to a stricture of the urethra. On January 1 he requested a urinal, and voluntarily passed four ounces of urine.

Two days later the catheter was removed, and the cystotomy wound allowed to heal. He now passes his urine voluntarily, has control over his bladder, and has exhibited no symptoms of cystitis. The patient's physical condition is good, and he has maintained a good appetite throughout. There are signs of emaciation in the parts affected, naturally resultant on non-use, but very little elsewhere. The laminectomy wound healed by first intention, the wound being redressed and the superficial suture and drain removed on the sixth day.

Faradization was applied daily to the bladder and rectum by means of the urethral and rectal electrodes. He now has perfect continence of these parts, and this treatment has been discontinued. Electricity has been administered to his lower extremities, and progressive improvement has been noticed, and massage is about to be commenced. His spine has been incased in a plaster-of-Paris jacket for the last month, and he wheels himself about most of the day in an invalid chair. No bedsores developed. There is no curvature apparent, and the results of the operation have been in every way most satisfactory, and we have every reason to attribute his improved condition to the operation and subsequent treatment.

The most remarkable feature of this case is the absence of cystitis. The fact that the bladder was continually drained by the catheter *in situ* after the median operation seems to confirm the theory that the cystitis following spinal injury is primarily due to distention,—*i.e.*, the paralyzed bladder-wall offers no resistance to the accumulation of urine, and its vitality is lowered by the constant distention, hence inviting the early invasion of sepsis. It is practically impossible to have in daily use a catheter absolutely aseptic. Approximation towards this is the best we can do, with all the care we may use.

Case II.—W. W., aged twenty-seven years, white, born in Virginia. He was brought to the hospital at 8 P.M. on October 13, having been struck by the street-car. There was no external wound, but evidences of contusion. His pain was intense, and referred to the seat of injury. There was complete paralysis of motion and sensation of the legs and lower two-thirds of the thigh. Pressure in the lumbo-dorsal region intensified the pain. Although crepitus could not be distinctly elicited, a slight deformity, together with the

history of the accident and the existing symptoms, made the diagnosis of fractured spine easy. The patient was in an extreme condition of shock when admitted to the ward. On reaction from this condition he suffered intense girdle pain, which he described as "a sensation of constant pressure on his ribs as though by spiked rings." This was relieved only by successive doses of morphine sulphate, one-eighth grain, hypodermically. Both bladder and bowels were paralyzed. Catheterization was ordered, and on the appearance of a cloudy urine and a rising temperature, his bladder was irrigated with sixteen ounces of boracic acid solution, using about three to four ounces at a time. This has been continued twice daily since then. The girdle pain continuing greater, and the paralysis, both sensory and motor, extending to about three inches below the umbilicus, laminectomy was deemed advisable, and was done at 11.30 A.M., October 19.

The spine of the first lumbar vertebra was found to have been fractured and driven in or impacted. The cord was greatly lacerated and contused. The laminæ of this vertebra, together with the two adjoining vertebræ (last dorsal and second lumbar), were removed, and the wound dressed as before. Immediately after the operation the girdle pain disappeared, but there was no relief of the paralysis, either motor or sensory, then or subsequently. The head of the bed was elevated and his head put in a suspension apparatus attached to the head of the bed, from which counter-extension could be made in the direct spinal line. This was discontinued shortly, owing to the extra amount of pain it caused, but the bed, however, was left on an inclined plane. His temperature chart has been very irregular, varying during the three months from 97° to 103°, having a mean of about 99° F. An enormous bedsore of the buttocks developed, notwithstanding our most careful attention, but is filling in very satisfactorily, the patient now being on a water-bed. There was delayed union in the laminectomy wound, which is now in good condition.

Our catheters were kept in sterilized towels, and were syringed with bichloride solution, 1 to 1000, both before and after catheterization. Before use they were immersed in a solution of glycerin and carbolic acid, two per cent., and again in sterilized oil. Notwithstanding all these precautions, which were adhered to strenuously, believing that cystitis rather than a symptom of fractured spine is resultant on careless continued catheterization, symptoms of cystitis developed, but subsided under the vesical irrigation with boracic

solution. His bowels are opened on alternate days by salines or enemata. The patient at the present time enjoys a fair appetite, and his general condition is good. He suffers no pain except on movement, but shows no evidence of any improvement as to the subsidence of paralysis, either of limbs, bowels, or bladder.

Pil. arsen. acid, gr. $\frac{1}{60}$, t.i.d., and pil. fe. quin. et strychnin, t.i.d., have been ordered as a tonic. There is still some deformity present, but it seems to be diminishing gradually.

From the library of the Surgeon-General, U. S. A., and other sources, I have been able to collect fifty-two cases of laminectomy within the last few years. I have endeavored to make my list include those cases reported since Dr. Samuel Lloyd[1] presented his very admirable article on 103 cases of spinal surgery. This is the most extensive collection of which I have knowledge at the present writing. Dr. J. William White has collected 37 cases of recent date. This list is intended to take up the work where the labors of Drs. Lloyd and White have left it. The most recent statistical study of cases of spinal surgery that I have found is that of R. Rieder.[2] Dr. A. Chipault[3] has collected 33 cases of spinal surgery, and reports 2 new cases. Mr. W. A. Lane[4] reports 11 cases, and presents an excellent article on technique, advantages, etc., of the operation.

Quite a tribute to the advance of modern antiseptic surgery is shown in the progressive improvement in the results of laminectomy. Dr. Lloyd reports of his non-antiseptic cases a mortality of 65 per cent. Those cases surviving the operation are distributed as follows: Cured, 1; partially cured, 7; unknown, 2; no improvement, 5. Of those cases operated on under the modern antiseptic surgery the mortality was 50 per cent.; those surviving are distributed as follows: Cured, 4; partially cured, 15; no improvement, 11. Dr. White, whose cases were all done under antiseptic precautions, reports a mortality of 38 per cent. Of those surviving there were 6 complete recoveries, 6 with benefit, and 11 without marked benefit.

[1] American Journal of Medical Sciences, July, 1891.

[2] Jahrbücher der Hamburg Stadtskrank., Leipzig, 1892, 236–301.

[3] Arch. gén. méd., Paris, 1890, II, 673–713.

[4] Trans. Clin. Soc., London, 1891–92.

In the following list of 52 cases there are 15 deaths (a mortality of 29.4 per cent.), 26 recoveries with benefit, 5 recoveries without benefit, and 5 recoveries in which the ultimate result has not been observed. Warren's case, having been operated on in the non-antiseptic period of surgery, is excepted in these statistics. It must be mentioned that several of the fatal cases below reported have been those of cervical fracture, which is by far the most fatal variety.

By comparison it is obvious to the most casual observer that the operation of laminectomy has steadily progressed in value, and is now not only a probable operation, but under many circumstances absolutely advisable. Any communication on recent cases not mentioned below will be gladly received for the author's memoranda on this subject

LAMINECTOMY.—CASES OPERATED ON SINCE 1890.

No.	Operator.	Reference.	Result.	Remarks.
1–11	W. A. Lane	Trans. Clin. Soc , London, 1891–92	Recoveries with improvement, 8 Recoveries without improvement, 1 Deaths, 2	All cases for paraplegia from compression.
12	C. M. Moulin	. . . . .	Recovery	Fracture second lumbar.
13	G. A. Peters	Internat. Clinics, 1892	Death	Tumor spinal meninges.
14	De F. Willard	Trans. Coll. Phys., Phila., 1892	"	Fracture.
15	" "	" " " " "	"	"
16	S. Lloyd	Annals Surgery, Phila., 1892	Recovery	Potts's paraplegia.
17	Davies Colley	Brit. Med. Jour., 1891, II	Progressively worse	
18	" "	Trans. Clin. Soc., London, 1891–92	Recovery; cure	Pressure sarcoma. Rhachitomy.
19	M. A. Starr	Internat. Clinics, Phila., 1891	Recovery	Fracture.
20	Mr. Bowley	Brit. Med. Jour., 1891, II	"	
21	" "	" " " " "	"	
22	A. W. Ridenour	Columbus Med. Jour., 1891–92	"	Fracture and dislocation.
23	H. A. Boyle	Med. and Surg. Rep., Phila., 1891	Recovery; successful	" " "
24	A. J. McCosh	New York Med. Jour., 1891	Death	Cervical vertebræ.
25	Golding Bird	Brit. Med. Jour , 1891	Recovery	Fracture. Operation third day.
26	F. D. Bird	Australian Med. Jour.. 1893	No improvement	
27	" "	" " " "	Recovery with improvement	
28	H. O. Pantzer	New York Med. Jour., 1893	" " "	Both cases some time after injury.
29	" "	" " " " "	Death	
30	E. Freeman	Eclect. Med. Jour., Cincin., 1893	Recovery with improvement	Fracture.
31	A. Parker	Brit. Med. Jour., 1893, I	Recovery with continued improvement	Sixth to ninth removed.
32	W. K. Hatch	Brit. Med. Jour., 1892, II	Death on seventh day	Operation five months after injury.
33	J. C. Warren (report)	Annals Surgery, Phila., 1893, XVII	Death on eighth day	Operated on by J. Mason Warren, Boston, in 1867.

LAMINECTOMY.—CASES OPERATED ON SINCE 1890.—Continued.

No.	OPERATOR.	REFERENCE.	RESULT.	REMARKS.
34	Delorme	Bull. et Mém. Soc. de Chir. de Paris, 1893, XIX	Death six hours after operation	Seventh, eighth, ninth, tenth, and eleventh dorsal removed.
35	"	Bull. et Mém. Soc. de Chir. de Paris, 1893, XIX	Recovery with improvement	
36	Weiss	Mém. Soc. de Méd. de Nancy, 1890–91	Recovery in three months	Fracture.
37	Burrell	Arch. gén. de Méd., Paris, 1890, II, 677	Death in thirty-eight hours	Potts's disease. Reported by Chipault.
38	Chipault	Arch. gén. de Méd., Paris, 1890, II, 676–703	Recovery; general health good four months after	Potts's disease.
39	"	Arch. gén. de Méd., Paris, 1890, II, 676–703	Death in three weeks	
40	C. Audry	Lyon Méd., 1891, 335	Death day after operation	Fracture.
41	Guillot et Moret	Union Méd. du nord est Reims, 1891, XV, 361	Recovery with improvement	Potts's disease.
42	F. C. Schaeffer	Jour. Am Med. Assoc., 1891	Recovery	Reports a case which may be considered virtually a laminectomy.
43	Southam	Brit. Med. Jour., 1892, I	. . . . .	Spinal caries.
44	David Myerle	Brooklyn Med. Jour., 1893, II, 428	Death on sixth day	Fracture fifth cervical.
45	John B. Roberts	Medical News, Phila., 1894, 265	Recovery; no improvement	Three times operated on. Fracture.
46	" "	" " " " "	" "	Hæmaturia. Fracture.
47	" "	" " " " "	Death in five weeks from sepsis	Bedsore, persistent. Fracture.
48	L. Steinbach	Ibid., 267	Death in two months	Death probably due to sepsis of bedsore.
49	Jas. Kerr	ANNALS OF SURGERY, June, 1894	Recovery with improvement	Operated on sixth day. Fracture.
50	" "	. . . . .	Recovery; little improvement	Operated on first day. Bullet-wound.
51	R. Rieder	Jahrbücher der Hamburg Stadtskrank., Leipzig, 1892, 236–301	Recovery complete	Fracture seventh and eighth dorsal. Fourth laminæ removed.
52	" "	Jahrbücher der Hamburg Stadtskrank., 1892, 236–301	Recovery; paralysis mentioned	Fracture sixth dorsal.

MALIGNANT STENOSIS OF SIGMOID FLEXURE OF COLON, WITH ENORMOUS COLLECTION OF FRUIT-STONES ABOVE STRICTURE; RELIEVED BY COLOTOMY.

By JOHN HOMANS, M.D.,

OF BOSTON,

SURGEON TO THE MASSACHUSETTS GENERAL HOSPITAL.

THE fact that a person can continue living and go about for ten years, after the lumen of the sigmoid flexure has become so small that it will not allow a cherry-stone to pass, is almost inconceivable. Still, I see no reason to discredit the story of the patient whose case is subjoined. He has been prescribed for by various physicians in the neighborhood of Boston during the last ten years, and has the appearance of a perfectly reliable and trustworthy man, honest, industrious, and self-respecting. All narrowings of the large intestine by malignant growths are slow in causing total obstruction and have an existence of many years. After colotomy they grow slowly, many of them remain quiescent for a long time, and some even retrograde for a time at least. The case to be described illustrates how very slow they may be in growing even after the calibre of the intestine will not admit the passage of a sphere only one centimetre in diameter, and it shows that nature can get rid of the less solid contents of the bowels through this very small passage, with pain and suffering and colic it is true, but still digestion is carried on and the bowels are sufficiently emptied. The history of the case since the operation also shows that colotomy in obstruction by cancer is sometimes almost remedial, or at least might be called semicurative.

The patient is a Dane, twenty-seven years old, who came to this country eleven years ago. When in Denmark he ate a large quantity

of dried cherries and prunes. He was in the habit of swallowing many of the stones, and they passed through the rectum until 1882. In the latter part of that year he began to feel sick with cramps in his bowels and excessive rumbling. Cathartics gave him no relief, but rather increased his sufferings.

In 1883 he came to the United States, and says that he has eaten no cherries since his arrival. His abdominal pains have continued and his bowels have been constipated. While his bowels are quiet he has felt much more comfortable than when they have been relaxed or moved by cathartics. Every few weeks he has had sharper attacks of pain, accompanied by a great rattling in his abdomen and by explosions of gases that could be heard across the room. These attacks occurred mostly at night. His occupation, that of a cabinet-maker, kept him from thinking of his pain in the daytime. In 1890 he had attacks of vomiting, and at one time threw up thirteen rounded black masses like cherry-stones. This relieved him for a few weeks. He has never been able to find any cherry-stones in his stools since 1882, though he has repeatedly looked for them.

The pain and cramps gradually settled into the right iliac fossa and several years ago he noticed a lump there. He has been told that he had dyspepsia and constipation, and his allusions to cherry-stones have been laughed at.

His appetite has continued good though he has grown emaciated, and he has not given up his work. Dr. A. L. Norris, of Cambridge, brought him to me at the Massachusetts General Hospital in April, 1893. On examination I found in the right iliac region a flat saucer-shaped tumor about four and a half inches in diameter and about two inches in thickness. It could be moved into the pubic region, into the iliac, lumbar, and hypochondriac regions. Drachm doses of Epsom salts were given to remove the mass, if possible. The medicine produced severe pain and nausea, but did not reduce the size of the tumor.

On April 6, the patient was etherized, and it was evident that there were collections in the abdomen resembling shot, or cherry-stones, as the patient asserted. These rattled when the abdomen was shaken, as did the neck-lace of beads in the abdomen of the child mentioned in Bob Sawyer's story to Mr. Pickwick.

The abdomen was opened in the right iliac region by an incision three inches long in the linea semilunaris. The greatly hypertrophied sigmoid flexure presented; through its thick walls hard, round bodies

were felt. The cæcum appeared to be normal. In the left central portion of the pelvis a hard, flattened tumor surrounded the sigmoid flexure and upper part of the rectum with its mesentery. It was apparently cancerous and was about seven inches long, by three wide, and two thick. This mass nearly filled the pelvis and was thick in the centre and comparatively thin at its edges. Resection of the intestine was impossible, as the growth could not be raised at all. The hypertrophied sigmoid flexure was brought out through the wound. A glass rod was passed under the bowel and kept it outside the abdomen. No stitches were used to unite the bowel to the parietes. The wall of the sigmoid flexure above the tumor was as thick as that of the right ventricle of the heart and its cavity was greatly dilated. The bowel and the wound were dressed aseptically and the patient recovered well from the operation.

During the next forty-eight hours there was some pain, relieved by morphia. On the third day, April 8, the gut was opened and the patient did not feel the incision in the slightest degree; there was free hæmorrhage, which was controlled by pressure-forceps and these were left on the bowel for twelve hours. The wall of the opened gut was one-quarter of an inch thick, and it was solidly adherent to the parietes of the wound. A few blackened cherry-stones and some fæcal matter came out of the opening at once. On April 9, more cherry-stones were found at each dressing and some prune-stones. The patient's pain was much relieved by the passage of the stones.

During the next two days more stones passed until the number had reached 120 cherry-stones and seventy prune-stones, which had come out of the artificial anus.

All the stones were passed in four days and none came afterwards, they were all jet-black in color. The patient improved rapidly in health, strength, and weight, and left the hospital on May 5 well and strong. He wore an artificial contrivance made by a surgical-instrument maker, but he has since made one for himself out of a hot-water rubber bottle and a diaphragm of wood which answers better than anything he has had made for him.

He is now, April 16, 1894 (more than a year after the operation), hearty and hale, has gained twenty-seven pounds, and never was in better health. He has no pains nor aches and works every day. Were it not for the time required to attend to his artificial anus in the morning he would have nothing to complain of.

His mother has just died, at an advanced age, of cancer.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, February 14, 1894.

JOHN A. WYETH, M.D., in the Chair.

RESECTION OF THE RECTUM FOR CANCER, AFTER OSTEOPLASTIC RESECTION OF SACRO-COCCYX.

DR. WILLY MEYER presented a patient from whom he had removed a constricting carcinoma of the rectum after osteoplastic resection of the sacro-coccyx. The patient was a woman, fifty-one years of age, who had entered the German Hospital the beginning of April, 1893. She had complained for about three months of progressive symptoms of stricture of the rectum. She said she had lost blood per rectum at times and was considerably emaciated. It was not until she had been narcotized that he was able to barely reach with the tip of his finger a distinct new growth, in the centre of which there seemed to be a small passage to the gut beyond. A point of interest was the fact that a number of large, hard, movable nodules could be felt in the left, and also in the right hypogastric region, by bimanual palpation. At that time he could hardly believe these were secondary growths. Large scybala were thought of. On April 2, he performed ordinary inguinal colotomy and then found, while the abdomen was open, that the large masses were fæcal concretions in the sigmoid flexure. The lower end of the descending colon was stitched to the abdominal parietes. While the patient was still under narcosis he was able to pass a catheter, of about No. 20, French gauge, through the stricture. The gut was not opened until two days later, by a longitudinal, not by a transverse, incision. The next three weeks frequent oil and water irrigation through the permanent catheter brought away much hard fæcal matter out of the opening in the left groin. Although Dr. Meyer was not sure the sigmoid curvature was quite free of all concretions, yet he did not wish to wait longer, and

proceeded to remove the growth, April 25, by the modification of Kraske's method, originally proposed by Rehn, of Frankfort-on-the-Main, in 1890, three years later once more by Rydygier. A longitudinal incision is made through the soft parts down upon the border, generally the left, of the sacrum from the posterior inferior spine to about midway between the tip of the coccyx and the anus. A transverse one is then added across the sacrum, where it is intended to divide that bone. In his former Kraske operations he had often had, as he believed was the case with other surgeons, quite some hæmorrhage after dividing the bone. To avoid this he tried, after the transverse incision with the knife had been made, loosening the soft parts over the lower aspect of the sacrum bluntly with the fingers. This succeeded well. Then on dividing the bone transversely with the chisel he had no hæmorrhage whatever. The skin-muscle bone-flap was then turned back, giving easy and perfect access to the tissues beneath. Now the rectum was shelled out, a number of enlarged lymphatic glands removed and the peritoneum opened. The mesocolon was ligated between two ligatures and the sigmoid curvature pulled down. After shutting off the peritoneal cavity, by stitching the peritoneum to the gut and draining on either side with a strip of iodoform gauze, he divided the gut above and below the stricture, thus removing the growth. To his dismay he found a large fæcal concretion still in the gut above, in spite of the three weeks' preparation. It was removed piecemeal. A second one was seen, but could not be reached. Nothing could be done but stitch up the gut by circular enterorrhaphy (inner row of catgut, an outer row of silk). The external wound was packed with gauze and the reflected skin-muscle bone-flap returned. The patient made a good recovery. On the third day she passed one of the large scybala, in spite of large doses of opium, through the wound, rupturing the line of sutures in the gut posteriorly. In the course of the next month a sacral anus established itself, through which defecation was going on. The inguinal opening closed to the size of a pin's head. Five months later the patient came again under Dr. Meyer's care. He then first reopened the gut in the inguinal region, and a few days later, after proper preparation of the gut, reincised the original wound, loosened the wall of the rectum from the surrounding tissue at the site of the sacral anus and closed the latter transversely by a double row of silk sutures. Primary union was obtained. Later Dr. Kammerer closed the colotomy wound. The patient had acquired perfect control of fæces and gas, and had

considerably gained in flesh. She had open bowels every day through the anus without trouble and had shown no evidence of return of the disease.

Dr. F. KAMMERER said that he had used such an osteoplastic resection of the sacrum six times and could testify to its efficiency. Three of the operations were for cancer, two for fistula, one for papilloid growth. In his opinion the method was an excellent one. The incisions could be made in very little time, and the hæmorrhage was very slight. There had been no exfoliation of the reflected bone in his cases. One of his patients, a man seventy years of age, who had extensive cancer of the rectum, died on the second day.

APPENDICITIS COMPLICATED WITH INTESTINAL OBSTRUCTION.

DR. ROBERT ABBE presented a boy who had been seized with a severe attack of appendicitis on December 16, 1893. When seen by Dr. Abbe, on the fourth day, he was in a very grave condition. The usual operation for appendicitis relieved the abdomen of a perforated appendix with abscess. For one week all went well. But by the twelfth day, after three days of fæcal vomiting, Dr. Abbe diagnosticated intestinal obstruction, and opened the belly in the median line, and found a coil of the small intestine distended, kinked, and held by an adhesion at the site of the appendix. It was with a good deal of difficulty freed from its ancient adhesions. He then incised the gut and let out a pint of fluid fæces which had collected above the obstruction, and immediately sutured the cut. The boy made an uninterrupted recovery thereafter. The point of interest in the case, he said, was the unusual cause of the obstruction,—namely, a point of adhesion at the site of the appendix, and the perfect relief afforded by laparotomy after fæcal vomiting had continued four days, also the slashing of the intestine. He dwelt upon the desirability of letting out of the gut the stagnant fæces through an incision of the bowel, instead of allowing them to rush into the released distal portion of the bowel where the ptomaines and other poisonous elements might be absorbed and add greatly to the dangers of the case. The suturing of the wound in the gut took but little time, was efficient, and the gut was immediately dropped back.

Dr. BRIDDON referred to a case in which a boy, operated upon in the Hospital for Appendicitis, was up and about the ward about the second week when he was seized with pronounced symptoms of

intestinal obstruction. It seemed some adhesion must have taken place, causing strangulation of the gut. He was put under the influence of chloroform, was inverted, a tube was introduced into the rectum, and as much water was introduced as would enter. At the same time massage of the abdomen was made and continued for a while after the recumbent posture had been resumed. Within an hour the patient had a copious dejection.

Dr. WYETH had operated on a case for acute appendicitis, and the same week symptoms of obstruction developing, he made an artificial anus, a large amount of fæcal matter and flatus discharged, and within six hours the relief from distention was complete.

Dr. F. H. MARKOE said he had operated upon a girl some days after a single attack of appendicitis. The symptoms present when Dr. Markoe operated were those of obstruction with fæcaloid vomiting which had lasted two days. The appendix was found lying directly across from the cæcum towards the left side, its extreme end had been perforated, and to that a loop of the ileum was bound which gave it a sharp turn directly backward, interfering with the passage of the intestinal contents. He severed the small but very firm old adhesion immediately. The loop of intestine filled again and the continuity of the lumen was restored. As a result, however, the existing peritonitis became worse and the patient died.

CHOLECYSTOTOMY.

DR. JOHN A. WYETH presented a patient, a merchant, forty-nine years of age, who had been in perfect health until three years ago, when he began to suffer from repeated attacks of gall-stone colic. On January 23, Dr. Wyeth made an incision parallel with the rib over the gall-bladder. The viscus contained 159 gall-stones, one of which was one inch in diameter. It was immediately sutured; there was no reaction, the patient had remained well since the operation.

A second case was related and a specimen presented. The woman, fifty-two years of age, had entered the Mt. Sinai Hospital with a history of recurrent gall-stone obstruction, and was intensely jaundiced at the time. Although she was in very bad condition, he operated, but upon reaching the usual location of the gall-bladder did not find it. After some search it was discovered, small, thin-walled, flattened upon itself, completely collapsed. No gall-stone was found. The wound was closed. The woman died three days later, and at autopsy a little stone, three-eighths of an inch in diam-

eter, was found in the peritoneal cavity near the cæcum. There was complete obstruction in the hepatic duct at the site where this gall-stone had suppurated through, the obstruction having given rise to jaundice by preventing passage of the bile. Dr. Wyeth added that he made the transverse incision because it gave more room.

CLUB-FOOT DUE TO EXOSTOSIS OF FIBULA.

Dr. Virgil P. Gibney presented a boy on whom he had corrected by operation club-foot due to an unusual cause, exostosis following fracture of the lower epiphysis of the fibula. The boy was about fifteen years of age, had sustained the fracture when two or three years old, received little treatment, union took place, but with considerable exostosis, and as he grew the foot turned in and finally presented marked club-foot. Dr. Gibney first thought it would only be necessary to chisel off the external mass of bone, but before he got through with the operation it became necessary to go to the extent of removing external malleolus and the head of the astragalus. In spite of the fact that the synovial fluid had escaped from the ankle-joint, the boy recovered from the operation without any temperature, and was hobbling about, wearing the plaster-of-Paris bandage, within three or four days. There was very good function in the foot at present and no deformity.

SURGICAL THOUGHTS ON APPENDICITIS.

Dr. J. D. Rushmore read a paper on this subject, which appears in full on page 576.

Dr. Abbe thought surgeons could not be too persistent in urging upon medical men the necessity for looking upon appendicitis as a surgical disease, or one in which the surgeon should be called in consultation at the earliest possible moment. He had seen two cases that week in which he was able to save life only because the physicians had sent for him early, they having been impressed with the importance of doing so by the teaching of Dr. McBurney and others. In the second case he operated about twenty-four hours after the initial pain, yet purulent lymph had already begun to form and would have soon led to gangrene of the appendix. It was the man's first attack.

Dr. Gerster spoke upon a question which he regarded as being of much practical importance,—namely, whether after evacuating an

abscess which was the primary indication for the operation, we were justified in going on to hunt for the appendix and remove it. This question had been forced upon him in a most disagreeable way recently; for the patient, immediately on coming from under anæsthesia, asked whether his appendix had been removed. Dr. Gerster thought Dr. McBurney had stated the case fairly at one of the first discussions upon the subject of appendicitis, to the effect that if the appendicitis were in the first stage, and there were no abscess, or only a small one, and the appendix could be readily got at, it was the surgeon's primary duty to remove it. But if the abscess were filled with decomposed, fetid material, and was surrounded by strong adhesions, shutting it off from the rest of the cavity, it would be bad surgery to make much search for the appendix, and in doing so risk infecting the entire peritoneal cavity. There were, however, cases on the border-line between these two classes, and there the individual disposition of the surgeon would probably decide whether he would or would not search for and remove the appendix. One, in his eagerness to do away with possible recurrence, would go further and remove the appendix, while another, fearing possible infection by his interference, would content himself with evacuating the abscess. Dr. Gerster regretted to have to record a case of death recently due, he thought, to his too great eagerness to remove the appendix. The abscess was not very large, and he thought he could reach the appendix easily, so he shut off the peritoneal cavity carefully, evacuated the abscess, dried out the inside wall, and scraped away loose material, in short, disinfected the cavity and the immediate vicinity as well as it could be done, but, unfortunately, there was another abscess behind the appendix which was opened accidentally in the search for the appendix, and flooded the entire field as far as the artificial dam. Nevertheless, infection must have taken place in the posterior portion of the abdominal cavity, for the patient developed acute septic peritonitis and died. It could not have been worse had he contented himself with draining the first abscess, left the appendix, and also taken his chances with regard to a second operation for the removal of the appendix.

Dr. McBURNEY thought that if we talked too earnestly of the necessity of calling a surgeon early it might have the opposite effect with the general practitioner, by giving him the impression that the presence of the surgeon always meant operation. We ought to try to allay this fear, as it certainly was in the interest of the patient and

surgeon to do so. He would suggest as one way of inducing the medical practitioner, pure and simple, to call a surgeon early, to ask the question whether he had any remedy of any kind whatever which he could recommend in any stage of the disease, and he would be obliged to answer that he had not. He thought this a fair question to put, and that if it were answered conscientiously, it would compel physicians to call the surgeon as soon as possible. Further, one might ask the physician whether this was a preventable disease; whether there was any means for preventing an attack of appendicitis. The answer to that question also tended to throw appendicitis largely out of purely medical hands. But it should at the same time be made clear that while surgery was the only remedy, yet, as in many other diseases, it was not always called for.

The subject had to be discussed with some caution before medical men, because the feeling was so strong that the presence of the surgeon meant an operation, and doctors were so much less inclined to let go their hold on cases of this disease than on others which were not any more surgical. They would not think, for instance, of retaining charge of a case which they had become convinced was one of intestinal obstruction, yet for some unaccountable reason they would hold to a case of appendicitis until, perhaps, a large abscess had formed. He had seen cases which had been under the care of a physician more than a month before he thought of calling a surgeon.

He agreed with Dr. Gerster as to the necessity for great caution in searching for the appendix in a cavity the walls of which were thick and septic, and removing a portion of that wall, for that was what removal of the appendix under those conditions amounted to. Of course, if the appendix were hanging free in the cavity one would not hesitate a moment to take it away. But where it had become a portion of the septic walls of the abscess cavity, sound surgery certainly required great caution about breaking up the walls for its removal. While he thought there was much danger to such a procedure, and preferred for that reason not to interfere with the appendix in such cases, yet he realized the liability to recurrence where the appendix, when not destroyed by disease, was left in the abdomen. He cited several cases in illustration of this point, appendical abscess having recurred after healing of the first by operation.

Stated Meeting, February 28, 1894.

The President, ROBERT ABBE, M.D., in the Chair.

EXCISION OF GANGRENOUS APPENDIX FOLLOWED BY INTESTINAL OBSTRUCTION.

DR. ARPAD G. GERSTER presented a girl, aged nine years, whom he had subjected to operation for relief of gangrenous appendicitis, October 14 last.

On incision a large, somewhat turbid, odorless serous effusion, unencapsulated, was found around the colon, which, together with adjoining coils of small gut, was much injected, but not adherent. The root of the appendix was exposed, and it was found that the organ was reflected down into the small pelvis towards Douglas's pouch, where it lost itself in a hard mass. On further separation of some recent adhesions a cavity was opened, from which about two ounces of fetid pus were cautiously removed by sponging. Then the appendix, located in this cavity, was turned out. It was found nearly four inches long, was gangrenous and perforated near its apex, non-adherent, and containing some fæcal concretions. Dissection of its mesentery was rather difficult on account of its density and shortness. For fear of injuring the colon, a ligature was not applied to one bleeding point, but an artery clamp was left *in situ*. The wound was drained and packed.

An immediate improvement of all symptoms followed. October 16 the dressings were changed in anæsthesia. Deep packings renewed after removal of clamps. October 19 rather profuse arterial hæmorrhage, apparently from artery which had not been tied, but it had stopped spontaneously by the time Dr. Gerster reached the patient, so nothing further was done.

October 22 it was noted that fever had set in, caused by retention in Douglas's pouch, from which fetid pus welled up through the wound on pressure from the rectum by the finger. A long drainage-tube was slipped into the bottom of this cavity, and immediately improvement followed.

About this time, after meals, severe colicky pains appeared, for which a dose of calomel was given, under the supposition that the colic was caused by retained solid fæces. The colic disappeared for a few days, but set in again with increasing severity towards the end of the month, and became much aggravated by constipation and

continuous non-febrile vomiting, which finally became distinctly fæcal on November 2. Characteristic distention of certain coils of gut was observed. These coils became very well defined during a spasm of colicky pain, when their squirming could be plainly seen through the abdominal walls. An internal obstruction was diagnosticated, and, as the child was apparently failing, laparotomy was decided on.

November 3, laparotomy. Fortunately the discharge from the appendicular abscess had become scanty and bland by this time. Nevertheless, the old sinus was first carefully scraped, wiped out, and packed with iodoform gauze. The old incision was then extended upward about three inches, well beyond the new adhesions to avoid injury to adherent gut.

On exposure, a much distended portion of congested small intestine came in view, behind which lay another flat, band-like, pale, and empty coil, the latter closely attached by recent adhesions to other similar coils and the parietal peritoneum of the small pelvis. These adhesions were all broken up. In fact, the small pelvis was emptied of its intestinal contents, and thus it was found that the collapsed intestine consisted of the ileum adjoining the cæcum, about three feet in length, its upper proximal portion crossing the median line to the left side diagonally at the navel. Finally, the place of constriction was found in the left hypochondrium. A band of inflammatory material was seen passing from the mesentery of this part of the ileum around the gut and to the other side of the mesentery, surrounding the intestine as a ligature would. On one side of this band lay the much-distended, on the other, the collapsed gut. After division of the band, intestinal contents were seen at once to enter the collapsed portion.

The wound was closed after irrigation of the abdominal cavity. The patient bore the operation excellently, and made an uninterrupted recovery. On November 4 there was a slight rise of temperature, but no distention, vomiting, or unfavorable change in the rate and quality of the pulse. November 5, the bowels were moved by a series of small doses of calomel. November 14 the patient was discharged cured.

Dr. McBURNEY suggested as to the origin of the obstructing band the following explanation: The inflammatory mass was broken up in the right iliac fossa. There were, of course, a large number of coils there. The adhesions were not limiting, and he supposed some

fibrin existed on the coils. Probably the coil which afterwards became adherent on the left side was one which had lain in the right iliac fossa, and when it became displaced or replaced, the adhesion band constricted it in its new position.

The inflammatory conditions favorable for the formation of bands were often present, and the wonder was that they did not occur more frequently. One often saw a coil of intestine with a mass of lymph about it and all the conditions pointing to the probable formation of a band, but the subsequent history did not point to constriction of any kind. The adhesions disappeared in some way. In this particular case a band remained and became organized. Probably all had observed at second laparotomies entire absence of adhesions where at the first operation lymph was observed in abundance.

Dr. GERSTER said that in this particular case sufficient time had not elapsed since the first operation for the fresh adhesions to have disappeared, yet the vast fresh adhesions in the small pelvis where he might have expected obstruction had caused no obstruction whatever, and it was not until he had broken up the adhesions of about three feet of intestine in this neighborhood that he discovered the real cause of the obstruction above. Dr. Gerster accepted Dr. McBurney's explanation of the manner in which the obstructing band had formed as probably the correct one.

VARICOSE ANEURISM OF THE HAND.

DR. JOHN A. WYETH presented a boy, two years and eight months old, with a dilated condition of the vessels, beginning with the subclavian artery of the right side, involving the axillary, brachial, radial, and ulnar arteries, and evidently anastomosing with the veins at the hand and wrist, forming varicose aneurism with a distinct bruit. The boy's home was at a high altitude in Nevada, and during his stay at the sea level there had been considerable diminution in the size of the hand. At Dr. Wyeth's request several surgeons of the city had seen the patient, and they were not yet decided whether the innominate was involved, but it was Dr. Wyeth's opinion that it was not. The carotid on that side did not pulsate more than that of the left. The affected hand felt much warmer than the other. As to treatment, it had been concluded not to operate upon this patient at present. Should unusual activity in the varicose vessels supervene at any period, operative measures, such as partial amputation or deligation of vessels, or occlusion by Roser's method, would be indicated.

Dr. ABBE referred, in connection with Dr. Wyeth's case, to one, which he had shown about ten weeks before, of aneurismal varix of the hand of considerable extent. The boy had been under treatment ever since. The radial artery had been ligated, and the tumor had been traversed in various directions by over a hundred silk threads dipped in a styptic solution and left in for two weeks. The result had been marked reduction in size, and numerous cord-like masses could be felt where the threads had penetrated the tissues.

Dr. GERSTER had seen good results in the treatment of such cases by various methods, and he thought we should not limit ourselves to any single one where a combination might do better. Deligation of the chief afferent vessel seemed to him one of the conditions of success. Then the diffuse part of the malady could be treated by excision of wedge-shaped portions, and the parts united by deep sutures. The method suggested by Dr. Abbe could also be applied in the superficial or cutaneous portions, although he did not believe they alone would bring about lasting improvement in deeply-affected parts. Percutaneous ligatures could also be employed. He had had the pleasure last year of seeing Dr. Mynter, of Buffalo, demonstrate brilliant results gained by percutaneous ligature, ten or fifteen being used with the result of nearly curing the case. Aseptic surgery, which did not attempt too much, would accomplish a great deal in these cases.

BRAIN TUMOR; DOUBLE TREPHINING FOR RELIEF OF PRESSURE.

DR. KAMMERER presented an adult woman with the following history:

She has never been ill; admits, however, the possibility of venereal infection, although she has had no symptoms of syphilis; has had no children. Her present illness began about a year ago with violent headaches on the right side, and vomiting. Fourteen days later, on awakening one morning, she experienced an unusual sensation on the right side of the head, and on closing the left eye, she for the first time became aware that she could not see with right eye; gradually hemi-anæsthesia, and then about five months later a hemiparesis of the whole right side of the body developed. The diagnosis of specific lesion was made, and the patient was put on large doses of iodide of potassiom—300 to 400 grains a day—for a long time, with no marked result. The attacks of headache and vomiting became

more severe every time they came on, and during the last three weeks before the first operation the patient vomited everything that she took.

She also complained of excruciating pain on the right side of the head, over the entire frontal lobe, whereas the left side was entirely free from pain. All external applications for relief—also mercury and iodide internally—having again proved useless, it was decided to operate to relieve intracranial pressure. The following was the condition of the patient before first operation:

Complete hemi-anæsthesia on right side.

Hemiparesis on the same side.

Right optic atrophy.

Partial paralysis of the right oculomotorius,—raising and lowering of eye impossible.

Complete paralysis of right olfactory.

Complete paralysis of right abducent.

Sense of taste is destroyed on anterior and posterior right half of tongue.

Sense of touch, temperature, and pain are much reduced on right side.

Right bulbus oculi protrudes slightly, and the iris on this side does not react to light, but does contract synchronously with the left iris.

Slight increase of tendon reflexes on right side.

The diagnosis was made of a tumor of the brain.

It was assumed that at least two foci were present, one in the left hemisphere, and the other on the right side at the base of the brain. Any radical operative measure being out of question, he trephined by the omega incision for the relief of pressure over the right parietal region, and removed a piece of bone three and a quarter inches long and two and a half inches wide, with Hartley's chisels, described by him for the operation of intracranial neurectomy. Leaving the bone in connection with the flap, he fractured its base with the intention of simply raising it at its upper margin, and thus increasing the capacity of the cranium, a method previously employed by Dr. McBurney. He found some difficulty in retaining it in this position, and feeling that great freedom would be afforded the brain if the bone was entirely removed, did so. There was primary union. After the operation—June, 1893—the pain on right side entirely disappeared, and there was no vomiting for several weeks, then occa-

sional vomiting set in. There was, moreover, a distinct improvement as regards paresis on right side, the patient being able to walk much better, and having more power in right arm and leg. There was also some sensation on pushing a pin into the deep tissues. The patient began to complain of pain on the left side, vomiting was more frequent towards September. Imagining, from the bulging out of the brain on the right side, that the former was perhaps due to mechanical causes set up by the first operation, he decided to do the same operation on the left side, and again removed a piece of bone in like fashion, measuring two and a half by two and a half inches. The effects of this operation, although also very apparent, were not as marked as the first time, but even now, nine months after the first operation, her condition is much better than before that time. Lately she has more pain on right side again, but rather at the back of the right eye. The latter protrudes very much now, being evidently pushed forward by the neoplasm, which, of whatever nature, has invaded the orbital space. At the time of the operation the dura was not incised, and in this way a prolapse of the brain avoided, as the large openings in the bone were deemed sufficient for, at least, some reduction of pressure. A few months ago, although the patient was fairly comfortable, he again anæsthetized her, and punctured both ventricles, believing that some fluid might be present. On the right side he withdrew several drachms of clear yellow fluid; on the left side, though several punctures were made, only blood. No change in the patient's condition resulted from this.

There is now considerable bulging of the brain on both sides, although the dura was not incised; and the object of the operation has been realized, perhaps not to so great an extent as if the brain had been allowed to protrude from the cranial cavity.

Dr. WYETH remarked that he had trephined in two cases with symptoms of brain tumor, and finding no tumor had sewed up the dura, but had not replaced the bone, improvement had followed relief of pressure, as it had in Dr. Kammerer's case. One of the patients had been comatose about two weeks. He had not made a will, but after removal of the piece of bone consciousness returned, the man was able to attend to his business for seven months, wrote a will which afterwards stood, and finally, at his death, the tumor of the brain was discovered to have been beyond the reach of the surgeon's knife. The other patient also became conscious after the exploratory operation.

REMOVAL OF EXTENSIVE OSTEO-SARCOMA OF UPPER JAW; NON-RECURRENCE.

DR. CHARLES MCBURNEY, in connection with the case shown Nov. 22, 1893 (see page 241), presented a young man to further illustrate the possibilities of non-recurrence after removal of extensive osteo-sarcoma of the upper jaw. The patient was operated upon a little over four years ago for sarcoma of the superior maxilla of nine months' duration. When he came under the reporter's notice the cheek was very prominent, the eye was bulging, the malar bone was somewhat elevated. The operation was the usual one for complete resection of the left upper jaw, the floor of the orbit and malar bone being also taken away. The healing was rapid. The patient has a plate to fill in the cavity, but, unlike most patients, finds it somewhat uncomfortable, and prefers to put in gauze, which he changes frequently. Dr. Hodenpyl, after microscopic examination, reported the tumor to be a small spindle-celled sarcoma. There is as yet no evidence of recurrence to be found. In reply to a question, he stated further that in his opinion the wearing of an artificial plate for filling in the defect in the roof of the mouth was to be preferred to any plastic operation.

Dr. GERSTER agreed with Dr. McBurney, for while the defect could be closed easily by a plastic operation, yet it would obscure any point of recurrence should this take place, and prevent early removal or other method of treatment.

Dr. MCBURNEY rejoined that in one instance he had operated fourteen or fifteen times for recurrence in the back part of the pharynx, usually with the cautery, through the aperture left after the first operation for removal of the upper jaw. Had the cavity been filled by a plastic operation the seat of recurrence would have been concealed from view.

Dr. ABBE also thought the advantages of leaving the cavity open very great, and he had done so in a recent case of fibro-sarcoma of the posterior pharyngeal wall, in which he had resected the upper jaw. He thought, however, that where there had been no relapse for four years it might be permissible to close the cavity by a plastic operation.

SPLENECTOMY.

DR. F. KAMMERER presented a spleen from a man of forty-five, who had been treated for malaria for the past three years, during which time a large tumor of the spleen had developed. Patient has taken

arsenic, iron, and strychnine in large amounts. During the past half a year he had been unable to do anything, suffering pain, and especially inconvenience from the rapidly-increasing size of his tumor, which reached on admission to the hospital beyond the median line to the right and down on the left side to the brim of the pelvis. It seemed fairly movable, and on standing it distinctly changed its position, sinking down somewhat towards the pelvis.

The ratio of white to red blood-corpuscles in many examinations showed such differences that the number are of no value. The number of red corpuscles was normal. There were no glandular enlargements. The post-mortem examination gave distinct evidence of the existence of leukæmia of the splenetic variety. The general conditions being good, after refusing to operate at first, he was finally persuaded by the urgent request of the patient to undertake extirpation of the spleen. An incision was made transversely, reaching from the lumbar region on the left to the outer border of the right rectus muscle, separating all the parts, including the peritoneum. A small incision was then carried, about three or four inches long, from the first in a downward direction along the outer border of the left rectus. Thus the lower border of the tumor was well exposed. Some of the omentum lying over it was ligated and severed. Then the lower border was raised and an attempt was made to reach the pedicle, separating the adhesions of the omentum as he worked on. The hæmorrhage from the original incision, and at this stage, was rather free, but was easily controlled; but this was otherwise when the large veins entering the spleen were reached. These were exceedingly brittle. He tore a small opening into one of them, although proceeding with the utmost care, and in trying to apply an artery forceps to it the entire vessel gave way, necessitating compression to prevent serious hæmorrhage during the greater part of the operation. Finally, he was able to ligate the vessels at this point by passing an aneurism-needle behind them, fortunately without injuring them, and to divide them between two sutures. He now began to separate the adhesions to the diaphragm. These were very firm and necessitated the application of much force, but he finally succeeded in developing the tumor from under the ribs and holding it over. It was attached to the stomach, pancreas, and colon. There was considerable, but not alarming, hæmorrhage from the adhesions to the diaphragm, which were immediately controlled by a tampon of sterilized gauze. It was now seen that only half the pedicle had been ligated, and that another

strand of vessels entered the spleen at a higher point than that which they had been able to reach from below. They were ligated and the spleen removed. The patient was in a fair condition considering the heavy loss of blood. Suddenly, after having tamponned the wound cavity, sutured the parietes and applied a dressing, the respiration began to fail and the pulse began to intermit; the anæsthetic (ether) had been stopped half an hour previously. Although stimulation of every kind and transfusion were resorted to, the patient did not rally, but died from shock. The spleen weighed seven and a half pounds.

The case demonstrated the dangers of splenectomy for leukæmia from hæmorrhages, and the many adhesions which one may expect to find in such large tumors.

RESECTION OF GUT FOR GANGRENOUS STRANGULATED HERNIA.

DR. A. J. MCCOSH read a paper on the above subject, for which see page 647.

RUPTURE OF THE KIDNEY.

DR. CHARLES K. BRIDDON read a paper on this subject, for which see page 641.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, February 5, 1894.

DR. WILLIAM HUNT, President, in the Chair.

FLAT-FOOT RELIEVED BY STEEL-SPRING INSTEP ARCH.

DR. THOMAS G. MORTON related the case of a gentleman who suffered from an acquired aggravated talipes valgus of the right foot, in which case very great improvement was at once secured by applying a lateral support to the weak ankle, and a steel-spring arch in the shoe.

The spring arch is fastened in the shoe directly under the tarsal arch; it is made of two elliptical pieces of steel which are three and a half inches long and two inches wide; one plate is flat, the other is arched on its inner side, which is intended to support the tarsal arch; the plates are joined together at their outer edge by a stout hinge, and the upper or arched plate on its inner side comes in contact with a lump of rubber which, when pressure is made from above, yields and gives the spring to the foot.

LITHOLAPAXY FOR STONE IN THE BLADDER.

DR. THOMAS G. MORTON related the histories of three cases in which he had recently removed calculi from the bladder by the Bigelow evacuator after crushing. They all recovered without complications.

Dr. WILLIAM W. KEEN called attention to his suggestion that in every case of renal colic the bladder should be systematically, and as a routine practice, washed out with the Bigelow evacuator, if the stone is not discharged within a few days.

Dr. H. R. WHARTON related the case of a boy who had been subjected to litholapaxy, but in whom shortly afterwards, the patient meanwhile having come under his own care on account of continued

vesical symptoms, by cystotomy he found a large stone, which presented still the marks of the lithotrite.

Dr. MORTON stated that he was of the opinion that any patient who has undergone litholapaxy should be sounded at intervals of three months afterwards, whether he has any symptoms or not.

PISTOL-SHOT INJURIES OF THE OPTIC NERVES.

DR. THOMAS G. MORTON related the history of a man, twenty-nine years of age, who had received a pistol-shot wound of the face, the ball penetrating the right superior maxillary bone just below the orbit and passing backward and to the left until it penetrated the cranial cavity. On the day following the injury, the patient was rational, complained of no pain, and replied to every inquiry. The movements of both eyes were normal; vision was apparently not disturbed in right eye, large and small objects being distinctly seen; left eye was totally blind, pupil widely dilated, yet sensitive when light was thrown upon the right.

Ophthalmoscopic examination gave the following results:

"*Right eye.* Pupil about 6.5 millimetres, somewhat oval horizontally, feebly sensitive to light stimulus.

"Optic disk fair size, somewhat oval vertically, rather dull in color, well outlined, margins slightly elevated; fundus rather deep in color; veins very full; arteries somewhat contracted; media clear, so that all details are possible, but general definition defective, owing to the slight haziness of cornea; tension normal.

"*Left eye.* Pupil four millimetres, not absolutely immobile, but not responsive to light stimulus, either with right eye open or closed; somewhat sensitive when right is covered. Optic disk fair size and shape; definition very good; the temporal half is leaden white, devoid of vessels; all vessels contracted on the nasal side of disk and throughout fundus, which has distinctly anæmic appearance; arteries very much contracted; no structural change except just below disk margin, where there is a small horizontal hæmorrhage one millimetre in size; media perfectly clear; tension normal; eyes in good position; movements normal. Large ecchymosis, bulbar conjunctiva temporal side; observed to-day."

On the eleventh day he died from septic meningitis.

Post-mortem.—The ball entered the superior maxillary bone just below the orbital rim, about one-eighth of an inch to the inner side of the infraorbital foramen, passing upward, backward, and to the

left through the nasal cavity, fracturing the ethmoid and vomer; the orbital plate of the frontal bone was fissured, destruction of left olfactory, breaking through the body of the sphenoid, tearing away the lesser wing on the left side, completely severing the left optic nerve in its groove or foramen; the ball then passed into the left frontal lobe, where it was found just inside a large wound which continued upward and slightly backward and penetrated nearly to the upper surface of the brain.

The brain tissue in and around this wound was softened and degenerated. Several fragments of bone were carried in the brain-substance by the ball, which was flattened and very rough. Evidence of suppurative meningitis existed over the entire base of the brain, and the vessels of the pia mater were markedly congested.

Dr. FENTON remarked that the most important appearance in this case was evidently the peculiar condition of the optic nerve and retina; although the disturbance of the pupils seemed to indicate some injury to the oculomotor and the fifth nerve. This lent more credit to the case because, as Mitchell says ("Injuries of the Nerves"), "Muscular injuries of the motor nerve of the eye which do not at once involve loss of life are rare." It is interesting to add that this quotation is taken from an account given of a case seen by the author in consultation with Dr. Morton, in which he, the author, states that the case stands alone in the history of oculomotor-nerve lesions.

Dr. W. W. KEEN related the case of a man, about twenty-five years of age, whom he saw at the Presbyterian Hospital, in Chicago, August 9, 1893, in consultation with Drs. D. W. Graham and N. Senn.

About three years before he had been shot; the ball entering just below the tip of the left mastoid. He was unconscious for a brief time, but when he recovered, either the same day or the next morning, he discovered that his right eye was absolutely blind. In addition to this, his right arm was paralyzed, but whether immediately after the accident or at a somewhat later period was not ascertained. When he saw him, the right arm was the subject of contractures, the result of the old monoplegia. The leg and face were not affected. There was a very marked aneurismal bruit and thrill, which could be felt down the left side of the head and neck. There was but little external swelling. The man sought relief on account of the noise produced by the aneurism, which made it impossible for him to do any work.

August 15 he ligated the common and external carotid arteries and the jugular vein of the affected side.

Considerable difficulty was experienced in consequence of the inflammatory adhesions resulting from the gunshot wound of three years before, and also from the fact that the vessels lay nearly under the middle of the sterno-cleido instead of under its anterior border. Even the ligation of the external carotid above the bifurcation was quite difficult by reason of the adhesions. It was done just at a point where the first branch was given off, and the ligature was made to include both the external carotid and its branch in one loop. The jugular vein was tied at a point half an inch below the level of the ligature around the common carotid, in order that the necessary injury to the tissues should not be at the same level. The veins were very full, giving thus an additional evidence that the diagnosis of arterio-venous aneurism was correct.

The wound healed practically by primary union. One angle was a little slow in closing, but there was no purulent discharge at any time. The morning after the operation ptosis and immobility of the left eyeball were discovered, although he could turn the globe outward somewhat and slightly upward. The pupil was not affected, but responded to light. There were no mental disturbances or paralysis. In two or three weeks improvement began in the eye, and when he left the hospital, four weeks after operation, he could keep the lid up nearly in a natural position, and could move the eyeball in every direction, promising complete restoration from the paralysis. His later history is unknown.

In this case the ball, after traversing the blood-vessels, entered the skull at its base, and without doubt cut the right optic nerve between the eyeball and the chiasm. The paralysis of the right arm was due of course to the involvement of the left motor cortex, or fibres proceeding from it. Whether the ball in entering the skull was split into two pieces, one of which injured the left cortex in the arm area, and the other the right optic nerve, or whether the paralysis of the arm was due to an embolus from the arterio-venous aneurism, can only be speculated on. None of the ball was ever found. What the final result as to the aneurism will be has not yet been ascertained.

Dr. KEEN inquired of Dr. Morton if, in his case, there would have been any advantage in opening the skull over the left eye in order to be able to make the wound aseptic and provide for

drainage? This might have rendered it possible later to have extracted the ball when it came down to a lower level.

Dr. MORTON replied that in this case, after the alcoholism had passed off, there was no evidence of brain injury with the exception of the loss of sight in the left eye. It was impossible to say whether or not the ball had penetrated the brain. When delirium came on and it was necessary to confine the patient, he was in a very grave condition which did not warrant any operation. The post-mortem showed that good-sized fragments of bone had been carried into the brain, and there was a general basilar meningitis with little or no pus.

Dr. J. M. BARTON said, with reference to the question of operation in pistol-shot wounds of the brain, that in a recent medico-legal case he had looked up the mortality of cases where the ball was removed as compared with the mortality where it was not removed. He had been surprised to find that the death-rate was nearly the same in both instances, out of some seven or eight hundred cases.

Dr. H. R. WHARTON remarked that he had had at the Presbyterian Hospital a case of pistol-shot wound of the brain similar to that reported by Dr. Morton. The patient, a boy, had blindness of one eye immediately following a pistol-shot injury, the ball entering near the inner canthus of the left eye. The boy recovered with the exception of the blindness, and left the hospital in three or four weeks.

THE USE OF STRONG CARBOLIC ACID IN SURGERY.

DR. OSCAR H. ALLIS read letters received by him from distant physicians detailing the favorable effects observed by them from the application of carbolic acid in full strength in burns, buboes, boils, and inflamed glands. He himself called special attention to the use of liquid carbolic acid, full strength, or, if the crystals are used, only enough water added to make a solution, as an immediate application to all varieties of burns. To think of applying to a raw and agonizing burn that which would scald a healthy cutaneous surface would seem to the unreflective mind a reckless and wantonly cruel act. But when we consider that a raw burned surface is painful from its exposed nerve-filaments, and that the strong acid combining with the albumen of the tissues forms a coating that excludes the air, while at the same time it benumbs—paralyzes—each terminal exposed nerve-filament, the remedy seems to be the result of a happy inspiration.

He urged a careful use of this drug in deep sinuses, no matter in what direction they run nor how deep they may penetrate.

Stated Meeting, March 5, 1894.

The President, Dr. WILLIAM HUNT, in the Chair.

INGUINAL COLOTOMY.

DR. JOHN H. PACKARD related three cases in which he had subjected patients to left inguinal colotomy on account of rectal obstruction. He advocated the operation as one productive of comfort, instead of rendering the condition of the patient intolerable, as had been declared by some authors. The procedure was also favorably commented upon by Drs. Barton, Roberts, and Morton. Dr. Deaver had preferred the lumbar operation, being influenced by the views of Mr. Bryant, of London.

EFFECTS OF ERYSIPELAS IN CARCINOMA.

DR. JAMES COLLINS reported a case of a sluggish ulcer of the cheek, of twenty years' duration, which had finally healed after an attack of facial erysipelas. Drs. Deaver, Horwitz, and Penrose reported cases of carcinoma in which injections of erysipelas toxine, or attacks of erysipelas itself, had secured no benefit.

IMPLANTATION OF CUT URETER INTO BLADDER, AFTER ABDOMINAL HYSTERECTOMY AND SECTION OF URETER.

DR. CHARLES B. PENROSE reported a case in which, in the course of an abdominal hysterectomy for carcinoma of uterus, he was obliged to excise one inch of the left ureter, which was involved in the growth. After the uterus had been cut away at the vaginal junction, the distal end of the ureter was ligated with silk; the vagina was closed; the peritoneum was sutured over the seat of operation as much as possible; and the proximal portion of the ureter was then implanted into the body of the bladder. An incision was made antero-posteriorly in the body of the bladder somewhat less than one-half inch in length. A needle armed with fine silk was passed through the bladder-wall from without in, at a point about one-third inch from the edge of the incision on the right, and brought out through the incision. It was then passed through the right wall of the ureter close to the extremity,

carried back through the incision in the bladder and passed through the bladder-wall from within out, close to its point of entrance. A similar suture was passed on the left side of the incision in the bladder and through the left side of the wall of the divided ureter. Traction on these sutures dragged the ureter into the bladder, and when tied, they held it in this position.

The loose peritoneum, which formed a partial investment to the ureter, was drawn down and sutured to the peritoneum of the bladder by a continuous silk suture around the line of union of ureter with bladder. The abdomen was closed without drain. A soft rubber catheter was introduced through the urethra and was retained for three days. The patient made an unusually easy recovery.

There were no symptoms of bladder or renal disturbance. The quantity of urine passed was as follows: 10 ounces in the first 24 hours; 26 ounces in the second 24 hours; 22 ounces in the third 24 hours; and 38 ounces in the fourth 24 hours.

She left the hospital twenty days after operation.

VAGINAL HYSTERECTOMY FOR CANCER.

Dr. John B. Deaver read a paper on this subject, claiming that it belonged to the field of the general surgeon. He advocated the use of ligatures for hæmostasis rather than clamps, regarding the use of the latter as unsurgical, since, in his opinion, there is less security against secondary bleeding, and greater liability to septic infection. Four cases were reported.

Dr. Penrose preferred removal of the uterus through an abdominal incision in all cases, if necessary making a preliminary incision in the anterior and posterior vaginal fornices in order to be sure that all infiltrated tissue in the vagina is removed. By this method any complications occurring may be more readily dealt with.

CONDITIONS JUSTIFYING REMOVAL OF THE TESTICLE IN RADICAL OPERATIONS FOR INGUINAL HERNIA; WITH A REPORT OF THREE SUCCESSFUL CASES.

Dr. Thomas S. K. Morton related three cases in which he had considered it best to add ablation of the testicle to formal procedures for the radical cure of inguinal hernia, stating that instances are rare in which this course may be considered justifiable, and that they must become constantly more and more so as radical procedures become perfected.

Removal of the testicle in operations for inguinal hernia should, in his estimation, be practically limited to the following conditions:

(1) Certain cases of undescended testicle.

Here, if the testicle had entered the canal and was degenerated or otherwise diseased, or could not be separated from the sac without endangering its vitality, or where it was manifestly functionless, it might be removed without reluctance. But if it were normal, or almost normal in all respects save position, it would be best, if possible, to displace the cord from the canal by one of the modern methods and attempt to bring the organ into the scrotum and there fix it by sutures; or it might be pushed within the abdominal cavity through the internal ring, and there permitted to remain after close suture of the ring.

(2) In some rare cases of congenital hernia.

Removal here must be very exceptionally called for with so many modern operative resources at hand.

(3) In certain cases of chronic or acute disease of the testicle or cord complicating hernia demanding removal of the organ upon its own account.

(4) In rare cases in which severe traumatism has occurred to testicle or cord during or before operation.

Accidental division of some or all of the vessels of the cord would not necessarily demand excision of the testicle unless other severe complications were present. Wounding or section of the vas deferens likewise might be consistent with retention of the organ. But where the gland has been stripped entirely from all other connections, such injury to its vascular supply would produce so much danger of necrosis that ablation would become imperative.

(5) In certain cases where sloughing of the sac or interrupted circulation of the cord or testicle has involved these latter structures in a suppurative or sloughing process.

(6) Perhaps occasionally in the very aged, to simplify or shorten operation, or for some of the before-mentioned conditions of less degree than would justify the procedure in a younger individual.

There are no conditions, of course, except senility, that would excuse the removal of a testicle under circumstances where it was the sole reproductive gland possessed by the individual; even more rare would be the conditions justifying removal of both testicles in double herniæ.

EDITORIAL ARTICLES.

IMMUNITY AGAINST TETANUS.

THE greatest possibilities, and the most hopeful outlook in therapeutics, seem to lie along the line of the employment of bacterial products as antidotes to these very products in some different form; and it is to bacterial products that we are now looking for the remedies with which to overcome the great category of infectious diseases.

Through the researches of Behring it was found that it is possible to render animals immune to tetanus by inoculations with the blood-serum of animals which had been rendered immune by treatment with tetanus products; and that it is also possible to cure animals by this means even when they are suffering from the disease.

Behring has observed that, unlike vaccination, in which a very small amount of the serum is sufficient, the tetanus serum must be given in a definite and fixed amount in proportion to the weight of the animal to be treated. His original experiments carried out on mice and rabbits gave no adequate idea as to the amount of the remedy which should be used in man; and he found it necessary to experiment on sheep and animals which had a body weight nearer to that of man. The more intensely the animal was inoculated to render it immune, and the longer it had remained inoculated, just so much less of its serum was required to cause immunity in another animal. For example, one gramme of serum from an animal which had been immune for a few weeks would protect an animal weighing 100 grammes; whereas, after the lapse of many weeks or months, the immune animal would supply a serum of which one gramme would save an infected animal weighing 500 or 1000 grammes. After the course of one year he had worked the thing down to such a fine point

that a horse, upon which he experimented, supplied a serum which had an immunizing value of 1 : 1,000,000,—that is, a serum of which one gramme sufficed to render immune 1000 animals, each weighing 1000 grammes. This small dose refers to the amount required to cause immunity in a well animal. When used in a therapeutic sense to check a tetanus which has already broken out, a much larger amount is given,—at least a thousand times this amount. Therefore a serum with an immunizing value of 1 : 1,000,000 possesses a therapeutic value of 1 : 1000.

Rotter[1] reports the case of a hostler, a muscular young man, who received a wound from an iron hook, tearing the fold between the thumb and index finger. Within fifteen minutes the wound had been irrigated with carbolic solution, and sutured by a surgeon in the neighborhood, and at the end of a week was perfectly healed. Eight days after the accident the patient observed a certain stiffness of the fingers, and opening and closing the hand was with some difficulty. In this condition he continued to work three more days. Two weeks after the injury, trismus, difficulty in swallowing, and pain in the neck developed. His general condition was so disturbed that he had to go to bed. On the following day trismus was pronounced, swallowing was very difficult, and the muscles of the back were becoming contracted. These symptoms grew more pronounced. The wound-scar was dense and sensitive, and formed a ridge the thickness of a lead-pencil. The hand was perfectly stiff, and the muscles of the arm were firmly contracted. The mouth would just admit the little finger, but in talking the teeth were tightly closed. The muscles of the face were contracted, and the back and belly were firm and hard. Occasionally convulsions were observed. Opisthotonos was so marked as to allow the passage of the fist between the back and the bed. On attempting to set the patient up, the whole trunk seemed one solid, inflexible mass. The legs were but slightly affected. Urination was difficult. The urine contained albumen. Perspiration was profuse. Temperature and pulse-rate

[1] Rotter: Deutsche medicinische Wochenschrift, No. 7, 1893, p. 152.

during the whole disease were normal. This was the condition of the patient when brought to the clinic. On the following day the patient was more depressed, the muscular rigidity had extended to the legs. The jaws could not be separated more than one centimetre, and the head, neck, and trunk were as stiff as a piece of wood. The introduction of a needle into the left arm caused a convulsion of the whole left side. The scar in the hand was excised, and found to contain small particles of dirt. On the same day the patient was injected in the back with sixty-six grammes of blood-serum from an immunized horse, to this being added 5 per cent. carbolic acid. The only narcotic given during the disease was .01 gramme of morphine. On the day following the injection, convulsions occurred as before. A second injection of fifty grammes was made in the pectoralis major with fresh serum, having an immunizing strength of 1 : 1,000,000. Next day the patient declared that he felt better. The muscular contractions persisted, but there were no further convulsions. Forty-five grammes of the same serum were injected on the following day, and the muscles of the face and back were much less rigid. On the fifth day of daily injections a final dose of fifty cubic centimetres of serum was injected.

The improvement continued till the patient was up and about; on the ninth day after treatment was discontinued. On the seventeenth day he left the clinic, and by the twenty-second all rigidity of the affected hand and forearm had disappeared.

Although a very large amount of the blood-serum had been used (250 grammes), no sign of harmful effect had been observed. The first two injections were accompanied with pain, but after this the treatment was quite painless. The tissues very quickly took up the large doses. Fifty grammes in one mass, under gentle massage, would be absorbed in a few hours, without causing any irritation to the tissues. The 0.5 per cent. of carbolic acid was added in each case.

Before estimating the value of the treatment in this case, the question of prognosis must first be considered. Here was a case of

tetanus in which the first symptoms of muscular spasm in the affected arm had developed eight days after the infection. On the fifteenth day lock-jaw was present; on the sixteenth, there developed spasm of the muscles of the abdomen and back; on the eighteenth, the spasmodic contractions involved the leg muscles; and until the twenty-second day, on which the treatment was begun, all of these symptoms were steadily growing worse. The treatment was begun after the symptoms had continued fourteen days. From that time, after two days of no observable change, the symptoms steadily abated.

Richter,[1] in his statistics, shows that in ninety-one cases, in which the period of incubation was as short as six to ten days, but 4.4 per cent. of the cases recovered. So that the chances of this patient of Rotter's recovering were very small indeed. And it appears very probable that the treatment at least influenced the course of the disease.

Similar experiences to the above have been reported by Tizzoni,[2] though his cases were less acute than the one described above.

An interesting study of the subject of tetanus has been made by Buschke and Oergel in the surgical clinic at Greifswald.[3] A nine-year-old boy was admitted to the clinic with the history of having been kicked by a horse on the previous day. He had sustained a compound fracture of the leg. Things progressed well until the morning of the eighth day, when he developed trismus and opisthotonos. In the course of the morning the symptoms of tetanus became more and more pronounced as successive groups of muscles were involved. At eleven o'clock the dressings were changed under an anæsthetic. At six o'clock, under narcosis, sixty cubic centimetres of blood were drawn from the right median vein for purposes of examination. At nine o'clock the tenesmus was very pronounced, and he

[1] Allgemeine Chirurgie der Schussverletzungen im Kriege, 1877, S. 845.

[2] Tizzoni-Cattani: Riforma medica, 1892, II, p. 5.

[3] Beitrag zur Kentniss der Tetanus, Deutsche medicinische Wochenschrift, No. 7, 1893.

was given an injection of ten cubic centimetres of Behring's serum subcutaneously. Half an hour later the lad died. The autopsy showed no sign of phlegmonous infiltration of the soft parts about the fracture.

This case was made the starting-point of a series of investigations. Some of the granulation material from the seat of fracture was employed to inoculate two mice, which developed the characteristic symptoms of tetanus on the second day and died. The pus from the wounds in these mice was used to inoculate two other mice. Both died of tetanus at the end of ten and fourteen hours respectively. Cultures were made from the pus at the inoculation wounds; and mice treated with these pure cultures died of tetanus.

The blood which had been abstracted from the patient was found to be sterile, it giving rise to no growth when applied to agar. It was allowed to stand on ice for twenty-four hours, and the supernatant serum was employed in the following experiments:

A guinea-pig was injected with one cubic centimetre of this fluid. Another guinea-pig was inoculated by placing a small cylinder of the coagulum beneath the skin and closing the wound. The first pig died on the sixth day, and the second died on the tenth day after the operation. Each suffered from opisthotonos and the other symptoms of tetanus.

This blood, it will be remembered, had been drawn before the patient was inoculated with Behring's serum. For further experimentation, blood was taken from the inferior vena cava of the corpse, and the serum of this blood separated. This also was found to be sterile. A guinea-pig was injected with one cubic centimetre of this serum; a mouse was given 0.5 cubic centimetre; and another mouse was treated with a bit of the clot beneath the skin. This last mouse developed convulsions soon after the operation; but after a few hours it recovered and remained perfectly well. Absolutely no symptoms were observed in the other two animals. As a result of these observations it must be concluded that the injection of ten cubic centimetres of Behring's serum had had an antitoxic effect.

Experiments with the saliva and sweat gave negative results.

From the liver, spleen, and spinal cord of animals perishing from tetanus, Buschke has been able to isolate an albuminoid material, which causes rapid and fatal tetanus in small animals.

It is worthy of note that in all of these animals free fat particles were found in the blood, and the question arises as to whether these may not play a *rôle* in the causing of death.

Buschke has also carried out a series of experiments to decide upon what organs the tetanus poison acts,—whether upon the muscles directly or on the peripheral nerves, or upon the nerve-centres. He experimented upon frogs with a very virulent culture of tetanus bacilli on bouillon. Ten frogs were inoculated and kept at room temperature. At the end of two weeks four of the frogs had developed tetanus. One of these was treated with curara. The tetanus immediately subsided and the animal died after an hour.

The sciatic nerve of another frog was cut out. Before the operation, the extremity had been the seat of rigid spasmodic contraction following the slightest touch. After dividing the nerve the leg hung loosely, and but slight convulsive movements could be excited. This frog was then poisoned with curara, and the tetanus at once subsided.

A third frog was decapitated, and the tetanic symptoms continued.

A narrow needle was passed into the lower part of the cord of another frog. As a result of this destroying the spinal cord, the tetanic symptoms disappeared from the lower limbs.

These experiments tend to show that the tetanus poison does not act directly upon the muscles, nor upon the peripheral motor-nerves, nor upon the brain, but that the spinal cord is the organ chiefly affected.

JAMES P. WARBASSE.

GOLDMANN ON THE AFTER COURSE OF SKIN-GRAFTS TRANSPLANTED AFTER THE METHOD OF THIERSCH.[1]

THESE researches into the process of repair in the method of grafting invented by Thiersch have been carried out at the surgical clinic of Professor Kraske in Freiburg, and throw much light upon the *rationale* of this process.

But a few years have passed since Thiersch published his new method for covering large defects of the soft parts by the transplantation of skin-grafts. Already the number of publications recommending and dealing with the method is very large. It only remains to work out the anatomico-physiology of the process, and this Goldmann has attempted. These researches are not only of theoretical value, but, by demonstrating to which sorts of defects the method is applicable and to which it is not applicable, they are of eminent clinical value as well.

Thiersch regarded the permanent covering of ulcer of the leg as a crucial test of the method. From many sources now comes the complaint that the method is not satisfactory in just this class of cases. Garrè observed, by careful histological study, certain changes in the underlying tissues which were the cause of the failures in grafting upon ulcer of the leg.

On the other hand, Urban, in the most recent publication from Thiersch's clinic, states that a permanent covering with Thiersch grafts is especially attainable in ulcer of the leg when an appropriate after-treatment is carried out.

Another question which Goldmann would answer is that with regard to the time when these grafts can be applied to the best advantage. For example, a defect of the nose is repaired by a skin-flap from the forehead. Should the secondary defect be grafted immediately after the operation, and what are the changes occurring in this place after months or years? When skin-grafts have been applied, and healing has taken place without the formation of granu-

[1] Ueber das Schicksal der nach dem Verfahren von Thiersch verpflanzten Hautstückchen, Beiträge zur klinischen Chirurgie, XI Band, 1 Heft, p. 229.

lations, after the course of months the new skin is observed to be slightly reddened, at first covered with lamellated scales, and later rather slimy, level with the other skin, more or less movable upon its bed, and lastly endowed with normal tactile, and thermic sensibility. None of the signs of scar-shrinkage are present. These facts give rise to the following questions:

(1) What is the cause of the peculiar scaling off of transplanted skin?

(2) Within what time after the grafting are the above-mentioned conditions to be observed? Do they appear synchronously or at different times?

(3) Upon what does the movability of the transplanted skin depend?

(4) How is it that the transplanted skin becomes elevated to the same level with the surrounding surface?

(5) How does the sensibility become restored?

When a skin-graft, which has been left uncovered, is observed, it is seen that the outer layer is cast off more rapidly than in the normal skin. Besides this, there is also an exfoliation of some of the deeper cells of the epidermis. There is also a vigorous cell-proliferation in the middle layer of the epidermis, which continues two or three months. After some months this scaling off ceases. This scaling is due to nutritive changes. It stops when the new system of vessels have formed beneath the skin which establishes a normal nutritive supply. This formation of new vessels immediately beneath the skin is the cause of the reddish tint which it assumes at this time, and which contrasts it from the surrounding skin.

Zander has shown that cutaneous cornification is dependent upon the nourishment of the particular area. The higher and more numerous the papillæ, or, in other words, the better the nourishment, just so much thicker will be the epithelial layer, and just so much less will be the shedding of the superficial cells. The poorer the nourishment, the thinner the skin. When grafts are first applied, the papillæ are very shallow and the skin very thin. Regeneration takes place from the deepest and middle layers.

In general, it may be said that the more abundant the blood-supply to the grafted area, the sooner will the new skin be elevated to the level of the surrounding skin surface. It not uncommonly occurs after grafting defects of the leg that a depression always exists. On the other hand, for example, after grafting the forehead, the excavation becomes obliterated in the course of four or six weeks.

The movability, too, of the new skin depends on the floor upon which it rests, the surrounding tissue, and, in part also, upon the size of the defect. In the case of small defects, the movability of the skin is observed in six or eight weeks. This may become so great in the course of months that the skin can be lifted up in folds.

The return of sensibility is the last to occur. In the case of large defects sensibility may never return, or it may be limited to the peripheral zone. Goldmann has observed in a large number of cases that the nervous function returned first to the periphery. Usually two or three months elapse before sensibility is fully restored.

The period elapsing before these physiological functions are restored is a very variable one, and influenced by a multitude of circumstances.

Before answering the question as to the movability of the skin, first must be answered, Upon what does this movability depend? Zenthoefer says that the elastic fibrous tissue has the function of holding the skin in its normal position, and returning it when moved. There is but little of this elastic tissue in such places where the skin is but slightly movable; whereas it is abundantly developed under skin which can easily be taken up in folds.

Goldmann has had an opportunity to make some sections through an area of skin grafted upon the upper part of the neck four months after the operation, and found that the skin was freely movable and abundantly supplied with elastic fibres. He was not able to decide when this developed or from what tissue it sprang. Garrè has observed such fibres at the end of ten days. It is probable that these fibres grow up from the underlying tissue and from the periphery of the defect. No elastic fibres are found in the ordinary scar-tissue, so

that when a granulating area is left between two skin-grafts here is a point of fixation. The presence of inflammatory tissue seems to retard or prevent the development of elastic tissue. The tendency to contraction exhibited by granulation-tissue and its ultimate diminished blood-supply make it a poor ground for the implantation of skin-grafts, which do much better upon a fresh wound surface.

Garrè has observed that the vessels in the transplanted skin degenerate, and new vessels grow up from beneath to the truncated papillæ. Goldmann's observations upon grafts three to five months after the transplantation showed vessels running along parallel to the surface at the border between the bed and the graft. These vessels were surrounded by small round cells. From these very fine branches passed up to the epidermis. Separated from the deepest layer of epithelial cells by a very thin transparent zone they curved, and, running along just beneath the epidermal epithelium, formed a rich anastomosis with the neighboring vessels. And everywhere were the appearances of cell-proliferation. Mitoses were observed in the endothelial cells within the capillaries, both at the ends of the capillaries beneath the epidermis and at their junction with the mother-vessels. The new vessels which form in the transplanted skin seem to be nothing more than capillaries, as the walls are made up chiefly of a layer of endothelial cells, and no muscularis is present. The capillaries constitute the "subpapillary net-work" of Spalteholz, through which the skin is nourished. This net-work is of great importance to the vitality of the newly-implanted skin, and the development of its vessels is not completed for several months.

With this development of new vessels is also a formation of elastic fibres and young connective tissue. Karg has made some observations in skin-grafts eight weeks old. In these he found that the transplanted skin was richly infiltrated with young connective-tissue cells. Numerous leucocytes were also observed, and newly-forming blood-vessels. The original cutaneous net-work had almost disappeared. There was also a vigorous cell-development in the epidermis.

The same observer discovered in grafts of twelve weeks' standing that the cutis was firmer and the cellular infiltration less, while the number of new connective-tissue cells in the normal skin was much increased.

Garrè studied skin-grafts four to eighteen months old, and observed that the upper part of the preparation showed the normal loose connective tissue, in which the vessels passed to the summits of the papillæ. There was no cicatricial or dense tissue, as has been theoretically supposed. These observations correspond with those of Goldmann, who thus explains the absence of any tendency to cicatricial contraction in grafted skin.

Observation shows that sensibility returns to the grafted area usually from the periphery inward. Sometimes a return of sensibility is observed in small areas surrounded by an anæsthetic surface. A number of such sensitive islands would become larger and larger till finally by their confluence the whole surface became sensitive.

As a result of the observations which Goldmann has carried out, the chief conclusion of clinical value is that the positive healing of skin transplanted after the method of Thiersch is not accomplished fully till the end of a period involving several weeks or even months, and not until this time has elapsed is the newly-implanted skin fully resistant and as capable of withstanding trauma and disturbances of nourishment as the normal skin; and, moreover, that a better vitality is assured when the skin is planted upon the normal soft parts than when granulation or scar-tissue forms the bed upon which the grafting is done.

JAMES P. WARBASSE.

NASSE ON THE EXTIRPATION OF THE SHOULDER, AND ITS VALUE IN THE TREATMENT OF SARCOMA OF THE HUMERUS.[1]

THE amputation of the arm, together with the scapula and a portion of the clavicle, was first performed by Cuming in 1808. It was

[1] Dr. D. Nasse: Berlin, Sammlung klinischer Vorträge, No. 86.

next accomplished in 1836, but since that time the number of such operations has steadily increased. Adelmann succeeded in 1888 in collecting the histories of sixty-seven cases. At the present time the operation is done much more frequently, but all cases are not immediately reported. This is due to the fact that while the first cases were regarded as miracles of surgery, to-day the cure after the operation is taken as a matter of course.

The methods of operation are very numerous, and are subject to constant changes and variations. The mode of amputation or of disarticulation of different portions of the body are, however, becoming more and more uniform in the hands of the best surgeons, and this operation is no exception to the general rule. The method here described is the one employed at Von Bergmann's clinic, and is the one usually adopted.

The operation begins with the typical ligation of the subclavian artery, just exterior to the musculus scalenus anticus. The clavicle is then sawed through at a point corresponding to the place of ligation. This permits the arm to be elevated, and the vena subclavia is ligated, and the plexus brachialis is divided. In order to facilitate these manipulations the skin incision for the ligation should be made longer than usual, and curved towards the acromial process along the clavicle, and the skin-flap thus formed should be dissected up from the bone.

The line of incision is next extended from the outer end of the primary incision downward across the axilla, and then curved backward as far as the inferior angle of the scapula. The musculi pectorales are then divided, and the shoulder thus freed can be drawn backward, allowing the scapula to be separated from the thorax as far as the scapular insertion of the musculus serratus anticus major. The musculus latissimus dorsi is then divided, thus freeing the point of the scapula. If this mode of incision be followed out the loss of blood is slight. Such hæmorrhage as occurs is easily controlled by hæmostatic forceps; a mass of gauze is placed beneath the scapula, which is then drawn back to its normal position. The dorsal inci-

sion is then made as follows: beginning at the outer end of the primary incision the line of incision is carried directly downward until it meets the ventral incision at the angle of the scapula. The dorsal skin-flap is then dissected up, the musculus cucullaris is divided, the cephalic and vertebral borders of the scapula exposed, and the muscles which are inserted along these borders are divided. With the division of the musculus serratus anticus major, the amputation of the limb is complete. Some slight hæmorrhage will usually occur from the arteria transversa scapulæ and arteria transversæ colli and their branches. Both vessels are easily controlled.

After the completion of the operation, the two flaps usually need to be trimmed somewhat in order to secure a smooth wound, free from pockets or inequalities. If the necessities of the case require that the dorsal flap must be left rather large, it is best that an opening for drainage should be made.

In the final preparation of the flaps care must be taken that no muscles should be allowed to remain whose blood-supply has been cut off. All the scapulo-humeral muscles as well as the musculus deltoideus are to be completely removed. On the other hand it is better to have both flaps as thick as possible. In a sarcoma of the scapula, for example, the musculi pectorales and latissimus dorsi may be allowed to form a part of the ventral flap; or in a sarcoma of the humerus which has not involved the scapula, the musculus trapezius should be left in the dorsal flap. By this means a thicker and better-nourished flap is secured, while if only the skin is left gangrene may result. Extensive gangrene of the flaps is unusual, however.

It is better that the vena subclavia should be ligated immediately after the artery, for the reason that the danger of entrance of air into the vein, should it be accidentally wounded during the operation, is avoided; there is also danger that during the manipulation of the tumor-mass some of the tumor-cells may be dislodged, which, were this avenue of escape still open, might readily enter into the circulation, and form metastases.

The ligature of the clavicular vessels as a preliminary step and

the formation of a dorsal and a ventral flap are the essentials of the operation. The remaining details may be modified to suit the particular case.

Although the operation seems so difficult and dangerous, as a rule, it is well borne. It has been performed by Von Bergmann in his clinic and in his private practice, fourteen times during the past few years, for various indications. But one patient has died as a result of the operation; in this case, on account of the involvement of the great vessels in the sarcomatous mass, and consequent danger from fatal secondary hæmorrhage, the sternum was resected, and the vena cava itself was ligated. Death occurred soon after this was done. The case was really an inoperable one, and should not be considered in forming an estimate of the mortality of the operation. In nearly all of the other cases the wound was healed in from two to three weeks.

Although the immediate results of the operation are so encouraging, unfortunately the final results in those cases where a sarcoma of the humerus has existed are not so good.

The numerous operative procedures employed in cases of sarcomata of the long bones vary greatly in their ultimate results. There is one form of such sarcomata, however, in which the tumor can be extirpated, and that, too, very near to the tumor-mass itself, with a considerable certainty of cure. This is the encapsulated giant-celled sarcoma which occurs in the region of the epiphyses. It is difficult to formulate the histological characteristics of this form of the disease, for the presence of giant-cells cannot be regarded as typical; these same cells are also found in some of the very malignant forms of bone sarcomata. Their number and regular arrangement are, however, of some diagnostic importance. The presence of multitudes of these cells can often be decided by the peculiar brown, reddish-brown, or spleen-like appearance of the tumor upon gross section. The anatomical and clinical peculiarities of this form of tumor are of even more value in making a diagnosis than are the microscopic appearances. The growth is entirely from within the bone, and not from the peri-

osteum. They occur in the epiphyseal region, and almost never in the diaphysis of the long bones. They are, above all, distinctly encapsulated,—an important factor in estimating their benign character. As a result of their slow growth, which may cover a period of from one to ten years, the periosteum has time to continually form new bone and connective tissue; this newly-formed material is deposited in layers around the neoplasm, and thus there is usually a smooth capsule present. In the medulla of the bone, too, there is, as a rule, a sharp line of demarcation which is often composed of firm, bony tissue. Should a break occur in the capsule, the tumor does not infiltrate the soft parts, but presses upon them in a purely mechanical way. These characteristics are those of benign growths.

It must not be supposed, however, that all giant-celled sarcomata of the long bones are benign; there are also well-recognized malignant forms. These latter have, almost without exception, well-marked variations from the class just described, both in their local development and in their anatomical characteristics. In all cases, therefore, the clinical history and the anatomical relation to their surroundings must be considered, as well as the histological appearances.

We are able, as a rule, to distinguish the benign encapsulated giant-celled sarcomata from the other forms of the disease affecting the bones, and in these cases it is not necessary that the operation should be so radical. As a general thing it is sufficient to remove the tumor carefully with curette and chisel, or to resect the bone. At any rate, one should endeavor to save the limb. Nearly all modern authorities agree upon this point. Occasionally, to be sure, a recurrence is observed, but in many cases a useful limb will be retained. In Von Bergmann's clinic four such operations have been followed by good results. One patient was entirely well after three years, and three after five years; all have useful limbs.

Such operations as these in the case of encapsulated sarcomata form the bright side in the treatment of such diseases of the bone. Unfortunately the picture is reversed with all of the remaining sar-

comata. The effort has frequently been made where some one of the other varieties existed to extirpate the tumor and preserve the limb, but never with a permanent cure. In all cases a recurrence took place. We should, therefore, with this one exception, make all operations upon sarcomata of the long bones as radical as possible by an amputation at a point as far as possible from the site of the disease.

Even with amputation at a point distant from the tumor, the results are but slight. This is primarily due to the alarming frequency and early appearance of general dissemination and formation of metastases. This is explained by the well-known fact that the sarcomata are closely related to the blood-vessels and follow their course, and are especially apt to grow into the veins. This venous infiltration will often escape our observation, but in sarcomata of the bones which have involved the soft parts, it is not at all rare to find veins that are filled with the tumor-tissue. The prognosis, in such cases, as regards recurrence, is, therefore, very grave.

Early diagnosis and operation are, therefore, necessary to guard against this general dissemination. If the formation of metastases has already begun, we are powerless to check the advance of the disease. As regards the local extension and local dissemination of the disease, the chances of success are greater. The paths which the disease follows are fairly well known. Sarcomata, as long as they are surrounded by their bony or periosteal capsule, are restricted in their growth. With a rupture of the capsule the growth of neoplastic tissue increases greatly in rapidity. This rupture of the capsule occurs with especial frequency at the insertion of muscles. The tumor-cells then begin to be generally disseminated in the muscle and its interstices. This spread of the cells probably occurs through the agency of the lymph channels. At any rate, it is hard to account for the fact otherwise. The surgeon is obliged, therefore, in every operation upon osteo-sarcomata to keep well clear of the tumor. With the fast-growing malignant sarcomata of the long bones it is necessary not merely to remove the diseased bone, but also to divide

the soft parts at such a distance proximal of the tumor that all diseased musculature is completely removed. By adopting this rule as a guide, recurrence will be rare.

Recurrence is especially apt to be observed in those cases where we are not able to remove the soft parts in this radical manner. The most unfavorable conditions in this respect exist where the femur is the bone involved. Some recent statistics go to show that up to the present time no case of sarcoma of the femur, where an exarticulation has been performed, has resulted in permanent cure.

The results in operations performed for sarcoma of the humerus are more favorable. When such a neoplasm exists in this bone, we are able, even when the adjoining soft spots are extensively involved, to operate at a safe distance from the tumor, for we can amputate the scapula and the clavicle together with the arm. If, on the other hand, the muscles arising from the thorax itself are involved, we are again confronted by the impossibility of removing all of the diseased muscle. In such cases recurrences are frequent.

Twelve of the fourteen cases of Von Bergmann above referred to were operated upon for sarcoma. In half of these, where the diseased musculature was not entirely removed, a local recurrence took place. In the others, where more radical procedures were adopted, no such recurrence was observed. Such results as these emphasize the fact that the complete removal of the soft parts involved is necessary.

It has long been known that the prognosis of osteo-sarcoma became much more grave as soon as the soft parts were involved. That local recurrence after operation is very apt to occur in such cases is not the only factor in this prognosis. Of much more serious import is the fact that the veins are usually involved, and so lead to metastases. All recent and reliable statistics show plainly this latter danger. Against this vein-involvement, and against the resulting metastases, we are, as already stated, powerless. The choice of the various methods of operation, then, is to be guided solely by the likelihood of a recurrence of the disease. An early diagnosis of the condition and the early performance of an operation before the cells

are in a certain sense endowed with life are, of course, important; but still more important is it for us to be radical in our methods when we do operate, and remove not merely those soft parts which are visibly affected, but those also which, as a rule, are the ones next to be involved in the neoplastic growth,—*i.e.*, the muscles attached to the affected bone. Should the tumor still be completely encapsulated, it may perhaps sometimes suffice to divide these muscles at a distance from the tumor. If, on the other hand, the musculature is presumably or visibly diseased, then the entire limb should be amputated at such a point that the affected muscles are without question entirely removed.

The practical application of this rule may appear to be open to considerable difference of opinion, for to follow it out leads us too often to operations of great magnitude. With carcinomata, however, a similar principle has been acted upon for some time, and with the best of results. So long, for example, as the axilla was only cleared out in those cases of mammary carcinomata where there were glands which could be felt on palpation, and so long as operators were anxious lest there should be too great a loss of substance, just so long were permanent cures rare. Since it has become the custom to thoroughly remove all the lymphatic glands in the axilla, even with the smallest carcinomata, and more recently even to remove the fasciæ and superficial layers of the pectoral muscles, the permanent cures have become much more common. Here our knowledge of the mode of extension of carcinomata, and the aids for our operative procedures which we have gained from this knowledge, has been acted upon with the best of results. Perhaps a similar benefit will result if we operate upon osteo-sarcomata with especial reference to their mode of extension.

This rule can easily be applied to sarcomata occurring in the leg and forearm, but rarely, indeed, in the larger tumors, never in sarcomata of the femur. In case the sarcomatous growth involve the humerus, we can succeed in the majority of cases if we remove the scapula and clavicle with the arm. It is for this reason, therefore, that in the treatment of this latter class of sarcomata the extirpation

of the entire shoulder is of especial importance. Just as we do not limit the clearing out of the axilla to those cases of mammary carcinomata which have evidently involved this space, so we should not remove the scapula and clavicle only in those hopeless cases in which the thoracic muscles are already involved, but in those cases as well of small tumors of the humerus as soon as they invade the upper end of the bone, or as soon as the soft parts lower down are invaded.

So far as the patients themselves are concerned, it is a matter of more or less indifference whether they possess the scapula and clavicle or not. The deformity caused by the flatness of the shoulder is easily hidden by padding. The danger of the operation is perhaps somewhat greater than in an exarticulation of the shoulder-joint, but the difference shown by our recent statistics shows this to be of little importance. We should be willing at any rate to subject the patient to somewhat more danger if we are able to assure him a much greater chance of remaining free from a recurrence of the disease.

H. P. DE FOREST.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. The Inoculability of Carcinoma. By Dr. GEISSLER (Berlin). Carcinoma has frequently been engrafted from one animal into another of the same species, and in a few instances it has been inoculated from man to man. All attempts at engrafting carcinoma from man into animals have thus far proved unsuccessful.

In a recent work, Adamkiewicz, of Vienna, declares that after implantation of a piece of carcinoma in the brain of a rabbit, death always took place in about twenty-four hours. In the brains were always found disseminated round-celled metastatic deposits of carcinoma, which showed a tendency to break down in the centre. The carcinoma-cells nearly all disappeared from the engrafted piece, leaving only the stroma. Cancer-cells, he thinks, are living, independent organisms, belonging to the class of protozoa. A cancer is simply a conglomeration of these cells. The poison of cancer is "cancroin," and is similar to a poison found in the cadaver. By injection of poison prepared from decomposing muscle the author expects to cure cancer.

Dr. Geissler repeated the experiments of Adamkiewicz, and found that pieces of cancer placed in the brains of rabbits produced no reaction, and were absorbed like any other animal tissue. He was able to get results resembling those of Adamkiewicz only when septic material was introduced. The round-celled metastases are conglomerations of spheres of myeline, produced by the action of alcohol on the brain during the process of hardening. Cancroin is simply the ordinary product from septic material.—*Archiv für klinische Chirurgie*, Bd. XLVI.

II. On Rhythmic Traction of the Tongue in Various Kinds of Asphyxias. By J. V. LABORDE (Paris). In a series of articles the author describes a comparatively new method of resuscitating the asphyxiated.

The method consists in seizing the tongue with forceps or a handkerchief, and making rhythmic traction on it at the rate of about eighteen to the minute. The traction is supposed to stimulate respiration by reflex action.

During the past few months, numerous cases in which this method has been used have been reported from various parts of France. It has been employed with success in asphyxia of the new-born, drowning, gas-poisoning, asphyxia after tracheotomy, and in chloroform narcosis. In some cases it was used alone, and in others it was combined with other means of treatment.

One patient, on whom artificial respiration had been practised without success for half an hour, was promptly revived by pulling the tongue for a few minutes. Another subject who had been under water for an hour was brought to life again by rhythmic traction on the tongue kept up for fifteen minutes.

This method, the author thinks, is one of the most important contributions to therapeutics of modern times.—*La Tribune Médicale*, November 9, 1893.

GEORGE R. WHITE (New York).

III. On the Influence of Chloroform on the Kidneys. By Dr. RINDSKOPF (Berlin). The writer has systematically examined the urine of 100 individuals who had been chloroformed. Only normal urine was chosen, which was examined at least twice before anæsthesia, and the last time a few hours before the operation. Both the officinal and Pictet's chloroform were employed. In 31 of 93 specimens which were available for examination, he found positive alterations where all other influences except the chloroform could be excluded. In 6 there was albumen alone, in 6 albumen and casts, in 19 cylindroids, in 21 numerous leucocytes, and in 19 epi-

thelium of different origins. In six there were red blood-corpuscles, which were, probably, of traumatic origin. As to the albumen, it was nearly always in mere traces which allowed of no volumetric determination. It was mostly found in the first urine passed after anæsthesia, and by the third day it had entirely disappeared. A similar cyclic, though more distinct, course was followed by the casts. They were most numerous on the morning after the operation, but they gradually disappeared, in the successive specimens, until by sixty to seventy hours after operation they had wholly disappeared. They were exclusively hyaline. The leucocytosis was the last to be noticed. Both the quantity of chloroform and the length of anæsthesia have an influence. Though the changes were only of transitory and reparable nature, yet they might be dangerous in renal affections in case of protracted anæsthesia. In order to limit its action as much as possible, he advises the use of the continuous drop-by-drop method of administration. In case of anæsthetization of one with renal disease he recommends careful examination of the urine and care in administration of the anæsthetic. He warns against chloroforming the same person on two successive days.—*Deutsche medicinische Wochenschrift*, No. 40, 1893.

IV. Anæsthetics and their Consequences in the Days immediately following Operation. By Dr. LINDH (Copenhagen). Lindh, in a paper before the recent Congress of Scandinavian Surgeons, calls attention to the varying statistics of mortality of chloroform from 1 : 14,000 to 1 : 2574 of Gurldt. The factors, in fatal cases, were a weak heart's action and deficient renal secretion. He has seen a few fatal cases after chloroformization, but is unwilling to attribute the whole fault to the anæsthetic alone. Out of 160 patients who were operated upon for unincarcerated hernia three died, with symptoms of collapse, cardiac paresis, etc. At the necropsy, only slight pathological changes, as fatty heart, nephritis, etc., could be discovered. A patient with renal lithiasis, on whom a suprapubic operation was done, on the fourth day was seized with cardiac weak-

ness, which was temporarily relieved by stimulants, but two days later he died, after a struggle of half an hour. In this case there was no infection nor poisoning by antiseptics, neither could the operation be regarded as the cause of death. Profound anæsthesia was not employed here nor in any of the other cases. During the past year he has employed ether as an anæsthetic, but he believes that he has observed pneumonia follow it more frequently than chloroform. Yet it might have been due to its having been a time when influenza was prevalent. He has employed the bromide of ethyl in about 1000 anæsthetizations and observed no disagreeable results. In the discussion, Professor Nicolaysen, of Christiania, reported two peculiar cases where death took place on the day following the use of the anæsthetic. Dr. Lassen, of Stockholm, referred to a case where death occurred forty-eight hours after the operation, without apparent cause.—*Hygeia*, No. 8, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

V. Salicylic Acid Injections in the Treatment of Inoperable Carcinoma. By Dr. F. X. BERNHARDT (Munich). The author has obtained very satisfactory results in the treatment of inoperable carcinoma of the uterus by the injection of salicylic acid. He experimented upon a carcinoma of the cervix with a 6-per-cent. solution of salicylic acid in 60 per cent. of alcohol. Parenchymatous injections were made into the ulcerated mass. The effect was marked. The discharge, which had been profuse, and the pain abated after the first day. It was observed that an actual retraction took place at the place of injection. The injection was repeated on the fourth day, and the same improvement followed. This treatment was continued for two months, at the end of which time the offensive discharge and the pain had entirely ceased; the appetite improved; the temperature subsided; and the patient felt in every way much better.

An ulcerating metastasis, the size of a pea, situated in the middle of the anterior vaginal wall, was twice injected. Three days after the first injection, the ulceration was healed; and a second injection caused the nodule to disappear. The primary cervical tumor became

contracted, hard, and scar-like. Its firm surface became covered with epithelium.

Five other such cases were treated by the same method, and the results found to be quite as satisfactory.

The injections were done in the following manner: A Braun's syringe was used, having a long needle of small calibre. Injections were made in various parts of the growth, but not more than two cubic centimetres was injected at any one sitting. The injections caused more or less pain, which soon subsided.

The author thinks that this method approaches very near to actually curing the disease.—*Centralblatt für Gynäkologie*, No. 39, 1893.

JAMES P. WARBASSE (Brooklyn).

NERVOUS SYSTEM.

A Contribution to the Study of the Surgical Lesions of the Pneumogastric. By Dr. DAVIDE GIORDANO (Bologna). In this contribution Dr. Giordano, first assistant to the chair of surgery at the University of Bologna, has presented a careful *résumé* of the work that has been done upon the physiology and traumatic lesions of the pneumogastric nerve, limited to the results that follow (*a*) accidental traumatic lesions due to external violence, and (*b*) lesions produced by the surgeon, either in operations upon tumors which include the nerves, or in accidental inclusions of the nerves in ligatures, etc.

The author collects the known recorded cases in a series of tables, presenting the statistics of ten cases falling under the first class. Of the surgical lesions there are presented forty-one cases, seven in an appendix, with details of the operation, symptoms, and results. In summing up the results attained by a study of these tables the author observes, "That, notwithstanding the many gaps that can be noted regarding these recorded cases, and in spite of the many contradictory symptoms and their insufficiency to warrant the conclusions that they are due entirely to the lesions of the pneumogastric, there are still a certain number of well-established observa-

tions upon which it is possible to come to the following conclusions: It can be seen that the total mortality due to lesions of the vagus nerves is about 60 per cent., with this distinction, that for wounds produced by firearms the mortality is raised to 75 per cent., while it descends to 53 per cent. in surgical lesions. And likewise for the various surgical lesions we note that the mortality does not rise above 45 per cent. in maltreatment of the nerve, whereas in resection it is 75 per cent.''

A series of experiments upon dogs and rabbits was instituted to endeavor to clear up some of the discordant results as brought about in a careful study of the tables, the whole making a valuable contribution to the knowledge of the subject.—*La Clinica Chirurgica*, Vol. 1, No. 6, June 30, 1893, pp. 241–273.

SMITH ELY JELLIFFE (Brooklyn).

HEAD AND NECK.

I. Two Cases of Successful Operation for Cerebral Abscess. By Dr. LINDH (Copenhagen). The author reported two cases before the recent meeting of the Congress of Scandinavian Surgeons. The first was a man of thirty-six years, who had suffered from suppurative inflammation of the middle ear. Ptosis of the left eye, spasms of the muscles of the back of the neck, and paresis of the face led to a diagnosis of cerebral abscess. The mastoid process was first trepanned and found normal. The temporal bone was then opened, and on trial puncture into the brain-substance pus was found quite deeply situated. A crucial incision into the dura mater and brain revealed pus two centimetres below the cortex. After evacuation a drainage-tube was introduced, and the cavity healed by granulation. After the operation the patient was seized with an acute psychosis and was delirious for three weeks. In the mean time the wound healed, and at the same time that he was about to be discharged and taken home the mental affection also disappeared.

The second case was a girl of eight years, who previously had not presented the slightest sign of disease, except a tuberculous ten-

dency. Yet three months before she had been sick for five weeks with an acute febrile affection, but from this she completely recovered. The day before entering the hospital she was seized with disturbances of speech, and some time before the operation a tumor of the vertex was remarked. It was diagnosticated as an abscess and incised. Pus was evacuated and a necrotic piece of bone was removed. Her speech has gradually returned. The origin of the abscess is obscure. Dr. Soederbaum in the discussion presented two similar cases.—*Hygeia*, No. 8, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

II. Fresh Points in the Operative Treatment of Cerebral Tumors. By VICTOR HORSLEY, F.R.C.S. (London). The author, in a paper presented to the British Medical Association, protests against the use of hammer and chisel in the removal of large bone-flaps with adherent soft parts from the cranial vault. He insists that hammering the skull increases shock, especially when there is already increased intracranial tension. He shows that the pericranium has no osteogenic power, and that, therefore, it is a matter of no moment whether it be kept in contact with the bone or no. In cases in which removed bone can be replaced it should be returned in large pieces and not cut into small pieces. For the purpose of avoiding the shock of prolonged operations, he advises operating in two stages,—in the first the bone alone is removed; in the second the operation is completed. Where a cavity is left, he advises packing it with gauze for twenty-four hours, for the purpose of giving support to the softened brain-tissue forming the walls of the cavity.

Macewen, following in discussion, expressed approval of the idea of operating in two stages, and said that he had followed that method during the last five years, especially in large and vascular tumors, since thereby not only was shock diminished, but also by the soldering of the membranes at the margin of the exposed brain the subdural space was shut off and the escape of blood into it prevented.—*British Medical Journal*, December 23, 1893.

III. Three Cases of Intracranial Neurectomy. By J. T. M. FINNEY, M.D. (Baltimore). The first case, a woman of forty-seven years, had suffered from neuralgia of the second and third branches of the right trigeminal for five years. Resections of the inferior dental and of the infraorbital nerves had been done with only temporary benefit. Hartley's operation was done September 7, 1893. By retracting the brain quite firmly, the second and third branches were brought into view just where they entered their respective foramina. Following backward, with these nerves as a guide, an attempt was made to tear through the reflection of the dura covering the Gasserian ganglion, but it resisted all efforts. The second and third branches were then divided as close to the bone as possible, and that portion of them between the foramina and the ganglion torn out. As much as possible of the ganglion was then picked out by forceps. The cavernous sinus is supposed to have been opened into during the efforts to uncover the ganglion, for a free venous hæmorrhage occurred, which was, however, easily controlled by a gauze tampon. The bone-flap was replaced, the iodoform gauze drain brought out through a notch in the bone-flap, to be removed on the fifth day. Uncomplicated healing resulted.

The second case, a man of sixty-three years, had suffered from neuralgia of the first branch of the right trigeminal nerve for eleven years, the affection having grown slowly in intensity. Hartley's operation was done September 7, 1893. The same difficulties were met with, and were dealt with in the same way. Piecemeal removal of the ganglion, by picking at it with forceps, was done. The wound was treated in the same manner as in Case I. No unfavorable symptom followed, except severe and obstinate vomiting for a few days. No pain since the operation.

The third case, a man of sixty-nine years, had a history of neuralgia of face dating back for three years. At time of operation the slightest touch almost anywhere over the right side of the head would cause a paroxsym of pain, always referred to the root of the tongue; most sensitive points seemed to be the lips and chin. Patient had

also very stiff arteries and mitral insufficiency. At earnest request of patient Hartley's operation was done, September 15, 1893. The middle meningeal artery was plugged in the foramen spinosum by "gutwool"; the edge of the petrous portion of the temporal bone was then traced forward to the point where the dura splits to be reflected over the ganglion; the dura was here divided and easily raised with a periosteum elevator so as to expose the ganglion in its entirety; the second and third divisions were then cut off close to their foramina, the ganglion was grasped with an artery-clamp and the entire root torn out from its attachment to the pons. Subsequent treatment of the wound as in the previous cases. Patient recovered satisfactorily from the immediate effects of the operation, and was apparently doing well, when suddenly, seven hours after operation. he became cyanosed and immediately expired. Autopsy showed high degree of atheroma of all the arteries of the brain, with cardiac dilatation and hypertrophy, and numerous globular thrombi attached to the septum.—*Johns Hopkins Hospital Bulletin*, October, 1893.

IV. The Primary Melanotic Tumors of the Orbit. By Dr. FELIX LAGRANGE. The author limits his memoir exclusively to the primary melanotic tumors developed in the orbit behind the capsule of Tenon; those tumors being entirely free from the globe of the eye and of the conjunctiva. There are gathered together in this memoir observations upon eleven cases of melanotic tumors. The author formulates: "There exist two important divisions of melanotic tumors,—false melanosis, produced by old hæmorrhages, and true melanosis, in which the pigment does not respond to Robin's reaction. Of this latter class, two clinical groups are to be observed:

"The first group includes those melanotic tumors arising in the uveal tract. These are very malignant, being so for two reasons, on account of the sarcomatous character of their tissues, and they contain the true melanotic poison of the metamorphoses occurring in the uveal tract.

"The second group includes the melanotic tumors developed in

the conjunctiva, eyelids, and the orbit. These tumors are not malignant, the pigment that they contain adds nothing to their malignancy, and the prognosis is by no means as serious as in the tumors of the first group."—*Arch. Clin. de Bordeaux*, Vol. II, No. 9, September, 1893, p. 413.

SMITH ELY JELLIFFE (Brooklyn).

THORAX AND ABDOMEN.

I. Case of Extensive Traumatism of Thorax Conducted to Recovery. By I. P. STRITTMATTER, M.D. (Philadelphia). The reporter related, at a meeting of the Philadelphia County Medical Society, the following case: A man, aged twenty-two years, was admitted to St. Mary's Hospital, September 10, 1890. About two hours previous he had sustained a penetrating wound of the left side of his thorax by a wagon tongue.

When first seen he was lying on his back. Respiration labored but painless, except when making an effort to change position or talk. Respirations 28, pulse 80; lips somewhat cyanotic; face anxious; no perspiration. His breathing was peculiar. On the right side of the thorax, respiratory movements were exaggerated in inspiration and expiration, and all the accessory muscles of respiration were brought into requisition. Abdominal respiration was apparently suspended, while the abdominal muscles were fixed and rigid. On the left side, over a space extending from clavicle to a little below the nipple line, and from sternum to axillary line, the movements were diametrically opposite to those on the right side. With each *inspiration* the centre of this area sank about three inches below, and with each *expiration* arose a similar distance above, the normal arc in chest circumference. Only two or three words at most could be uttered before necessity for breath caused a pause. At each inspiration the movements of the heart were perceptible in the lower inner angle of this space.

The heart and thoracic cavity being only protected by contused skin without bone or muscle support, an incision one inch long in the centre of the space permitted an exploration with one finger. The

pectoralis major was pulpified. The third, fourth, and fifth ribs were fractured; the third at the sternum (green-stick), at a point two and a half inches external to this point, complete, with separation of ends, and again at a point four inches external to latter fracture, complete, but the fragment held up by intercostal muscles and parietal pleura. The fourth rib was separated at its junction with its costal cartilage, and fractured at a point five inches external. The fifth had a green-stick fracture of cartilage near sternum, a complete fracture four inches external, and complete fracture at a point corresponding with fracture of rib above. All these fragments were in the pleural cavity; some quite freely movable, others somewhat fixed. The lung could not be felt. The incision having been enlarged so as to permit a complete inspection of thoracic cavity, it was found to contain several fragments of ribs, about a quart of clots and fluid blood. The lung was collapsed, occupying a space as large as the fist, no wound being found in it. No bleeding-point inside the pleural cavity, and very little from intercostal vessels. Some bleeding from shreds of pectoralis major required one ligature. About two minutes after enlarging the incision and introducing the hand, the patient became more cyanosed, respirations falling to 4 per minute, pulse dropping to 16. The placing of a large sponge in the thoracic cavity, and closing the flaps of skin so as to shut off the entrance and escape of air, was followed by immediate improvement. At the expiration of two minutes, respirations were 12, pulse 56. A silver wire was passed under the fourth and fifth ribs respectively, while two were passed under the third, keeping as close to the ribs as possible, and the fragments drawn up in position. The chest cavity was washed out with a boric acid solution (3j to a pint of hot water). The sponge was removed, and the intercostal tissues and shreds of pectoralis major stitched with sterilized catgut.

The ends of silver wire were brought through the skin at a point directly above the emergence from under the ribs; finally, the skin wound was closed with silk; the ends of silver wire were fastened by twisting over three pairs of long, gauze-wrapped hæmostats that

effectually bridged over the space occupied by third, fourth, and fifth ribs, resting on the second above and the sixth below. The whole anterior and left lateral thorax was covered with gauze, and a thick layer of cotton secured by straps of rubber plaster and bandage. The patient reacted well from chloroform anæsthesia, and was conscious before his dressing was completed, apparently none the worse from heart-failing and bosom-cleaving experience. Respirations 22, pulse 94. Thoracic and abdominal respiration, but mainly the latter. Could take a deep inspiration without pain or inconvenience, and could utter quite a long sentence without stopping for breath, in marked contrast with the half-audible voice and interruption for breath after every other word prior to adjusting his thorax. During the night the dressings became saturated with blood, that upon investigation came from one of the small arteries in the pectoralis major. It was readily controlled by ligature. Temperature on following day was 99° F., pulse 100; P.M., temperature 100° F., pulse 100. Patient comfortable. September 12 (second day), A.M., temperature 100° F., pulse 110; P.M., temperature $101\frac{1}{5}$° F., pulse 110. September 13 (third day), some oozing of serum from wound, saturating the dressing; air entered and escaped through the middle of wound; temperature 100° F., pulse 110. September 14 (fourth day), A.M., pulse 100, temperature $100\frac{2}{3}$° F.; P.M., temperature 101° F., pulse 108.

Some pus on the dressing was evidently from a little sloughing of the pectoralis major. About one-half pint of bloody serum was emptied from left pleural cavity by turning him on his left side; cavity washed out with boric acid solution. Opening in chest was tamponned with iodoform gauze; chest dressed as usual. His condition and treatment were about the same until September 20, or tenth day after injury, when the silver wires being loose were removed, the fragments of ribs having sunken but little below the chest-level, and apparently not dependent upon external means for holding their position. At the end of four weeks he was permitted to get up and walk about the ward. On the twenty-eighth week after the injury he

resumed his work as a teamster. The first breath-sounds were heard on the left side in about eighteen months. He now breathes fairly well down to the fifth intercostal space. His chest measurements are almost equal on the two sides, there being a difference of about two inches in favor of the uninjured side in the axillary and nipple lines, while the difference of expansion during forced and passive respiration is but 0.75 of an inch.—*Transactions Philadelphia County Medical Society*, 1893.

II. Suture Material and Methods of Suture in Abdominal Wounds. By Professor HOWITZ (Copenhagen). Howitz, in a paper before the recent Congress of Scandinavian Surgeons, presented the conclusions at which he has arrived from experience. He no longer employs the median incision, but incises through the rectus muscle of the side on which he intends to operate. Thus he has obtained more extensive wound-surface and better cicatricial formation than in the fibrous linea alba. He prefers silkworm-gut to all other material. All hæmorrhage should be stopped before the sutures are applied, and the patient must remain for three weeks in bed after the wound has healed. With these precautions he would prevent abdominal hernia after laparotomy. Professor Ask, of Helsingsfors, said, in the discussion, that out of 200 laparotomies he had seen but one single case of ventral hernia after laparotomy. He thinks that this is due to his using the proper suture material, silkworm-gut. It is strong, clean, and smooth, while it causes no irritation of the canal of puncture. He, as a rule, employs the median incision, and has seen no disadvantages follow. Professor Salin, of Stockholm, has used silk for suturing. He has not been so fortunate with regard to eventration as the preceding speaker, and has been obliged sometimes to do a second laparotomy. He applies a special suture to the peritoneum, buried serial sutures to the fascia, sutures to the skin, and several sutures to the whole abdomen to relieve tension.—*Hygeia*, No. 8, 1893.

III. Operations on the Biliary Passages and Formation of Adhesions in the Upper Part of the Abdomen. By

Professor LENNANDER (Stockholm). Lennander reported his operations on these passages before the recent Congress of Scandinavian Surgeons. He has operated fourteen times for various affections of these passages, of which thirteen were cholecystenterostomies and one a cholecystotomy. He is an advocate of relatively early operation. If the patient has pain and the gall-bladder is palpable, he should be sent to a surgeon, but if it cannot be felt, it is better to wait. In every case of icterus, one should examine the fæces for gall-stones. If they are found, no operation is necessary, but if they are absent and the attacks continue, operation should be done as early as possible in order to prevent the appearance of cholæmia. As to the various methods, he prefers Winiwarter's cholecystenterostomy. To the technique he has nothing to add. He recorded a series of cases of extensive adhesions of the upper abdomen, which caused intense pain and disturbances of digestion, and which were removed by operation. —*Hygeia*, No. 8, 1893. FRANK H. PRITCHARD (Norwalk, Ohio).

IV. The Surgical Palliative Treatment of Cancer of the Pylorus: Gastro-Enterostomy. By Dr. J. J. MATIGNON. The author describes the various surgical methods that have been in vogue, discussing the question of the incisions advocated by Billroth and Wolfler, Jaboulay, Rydigier, Pozzi, and others; the site, length, and character of the incisions beneath the skin are fully discussed; the sutures and the plates of Senn receiving due attention.

The statistics of the operation are, in the author's mind, encouraging. "At the beginning, according to Billroth, the mortality was 50 per cent.; a few years later Lücke, of Strassburg, reduced this to 31 per cent. In England and in America, where the gastroenterostomy is done by means of decalcified bone plates, the mortality is not greater than 11 per cent." The article is closed by a table of 188 cases, culled from the literature of the world, and is a *résumé* worthy of the attention of surgeons, the facts collated referring to the distant as well as the immediate results.—*Bull. gén. de Thérapeut.*, Vol. CXXV, August 15, 1893, p. 97.

SMITH ELY JELLIFFE (Brooklyn).

V. Successful Enterectomy for Traumatic Rupture of Ileum. By F. H. WIGGIN, M.D. (New York). A boy, fifteen years of age, was kicked in the right lumbar region by a horse. Thirty-six hours later he had a temperature of 102.7°, pulse of 116, and respiration 33. Abdomen was tympanitic and tender, with muscular rigidity of its walls. He had vomited blood about twelve hours after the injury. A four-inch median abdominal incision below the umbilicus was made. The small intestine was drawn out and carefully examined, passing from the ileo-cæcal junction upward; near the jejunum a bruised and livid knuckle was discovered. Though no perforation was discovered in it prior to removal, afterwards a small perforation near its mesenteric border was found. About six inches of the intestine, including the injured portion, was excised, safety-pins being used for clamps. The vessels in the cut mesentery were ligated separately, and the edges of the mesentery united by a continuous suture of catgut. The healthy ends of the ileum were brought together, invaginated, and united by Maunsell's method.

While the ileum was being excised the patient came out from the influence of the ether, strained and tried to vomit, and a quantity of blood and fæcal matter escaped into the peritoneal cavity. This accident was due to the large size of the safety-pins. A liberal quantity of a fifteen-volume solution of hydrogen dioxide was poured into the cavity, and allowed to remain while the ends were completely joined, when more hydrogen dioxide was poured over them. Some time was allowed to lapse before the resulting foam was washed off, and the cavity flushed with normal sterilized salt solution (0.6 per cent.). Then the intestines were returned to the cavity, which was freely irrigated and left full of hot sterilized salt solution. The wound was closed, no drainage being employed. The operation from the time of beginning the anæsthesia occupied an hour and a half. At the end of twelve hours, the pulse had risen to 136; temperature was 102°. At the end of twenty-four hours pulse had fallen to 118, temperature to 100°; and gas escaped from the rectum. Progressive

improvement continued thereafter. After about sixty-one hours the bowels moved without aid ; and during the ensuing twenty-four hours five large movements occurred. Up to this time he had been receiving one-eighth of a grain of morphine every three hours. This was now stopped. His subsequent convalescence was uninterrupted. He has since remained in good health.—*New York Medical Journal*, January 20, 1894.

VI. Cholecystenterostomy by the Use of Murphy's Button. By Dr. J. B. MURPHY (Chicago). The technique of this procedure is as follows: An incision is made from the edge of the rib, two inches to the right of and parallel to the median line, extending downward three inches. The gall-bladder is drawn into the wound, also the duodenum. The duodenum is cleared of its contents by gentle pressure with the fingers, and kept empty by suitable compression at either side. A needle with fifteen inches of silk thread is inserted in the duodenum directly opposite its mesentery, and at a point near the head of the pancreas. A stitch is taken through the entire wall of the bowel, one-third the length of the incision in it to be made. The needle is again inserted one-third the length of the incision from its outlet in a line with the first, and brought out again embracing the same amount of tissue as the first. Thus, a loop of the thread three inches long being held, a couple of stitches are again taken in the reverse direction, and parallel to the first row, and one-eighth of an inch from it. Thus is formed a running loop which, when tightened around the button after it has been introduced, draws the incised edge of the bowel within the grasp of the cup. In the gall-bladder a similar running thread is put. An incision is now made in the intestine, between the rows of suture, in length two-thirds of the diameter of the button to be used. The intestinal half of the button is inserted through this, the running thread tied, and the shank of the button held with forceps.

In the wall of the gall-bladder a similar incision is made, and the other part of the button similarly introduced and secured in it.

The two parts of the button are then grasped with the fingers and pressed together. A sufficient degree of pressure must be used to bring the serous surfaces of the gall-bladder and intestine firmly in contact and compress the tissues. Necrosis of the tissues embraced within the cup ensues, leaving an opening as large as the button, and the button drops into the bowel and escapes *per anum*.

The author has gathered reports of seventeen cases in which this operation has been done for gall-stones, eight of which have been done by himself. In all of these cases the result has been a complete restoration of health, and no recurrence of symptoms. The period of convalescence was in all cases very short, and the patients were not seriously sick immediately after the operation. In one case done to relieve obstruction from carcinoma of pancreas, in which the anastomosis was made with a loop of small intestine, a fatal result followed, due to twisting of the bowel.

This operation is indicated: (1) In all cases where it is desirable to drain the gall-bladder for accumulations therein; (2) in all cases of perforation of the ductus choledochus, where the duct must be obliterated by the reparative process; (3) in all cases of cholelithiasis where obstruction of duct is present, or where the reflex disturbances of digestion are marked; (4) in all cases of cholecystitis, either with or without gall-stones; (5) in all profusely-discharging biliary fistulæ.

The operation is contraindicated: (1) In all cases where the gall-bladder is too small for the insertion of the button; (2) where the adhesions are so extensive that the bowel cannot be brought into contact with gall-bladder without kinking; (3) where the ductus cysticus is obliterated, cholecystectomy being indicated in such cases; (4) where the gall-bladder is enormously enlarged, with an elongation of the cystic duct, and without obstruction of the common duct. In such cases cholecystectomy should be done.—*Medical Record*, January 13, 1894.

VII. Ileo-Colostomy for Cancer of Cæcum. By Dr. A. Boiffin (Nantes). In the case of a woman, fifty years of age,

who for eighteen months had been gradually developing symptoms of malignant disease in the right iliac fossa, which were becoming increasingly threatening of complete obstruction, the reporter opened the abdomen and exposed a growth involving the whole extent of the cæcum and the ascending colon, which was irremovable. A loop of small intestine about 25 centimetres distant from the growth and the middle portion of the transverse colon were then drawn out of the wound and an anastomosis effected between them as follows: a segment of each gut was first shut off by a circlet of small rubber tubing; the two loops were then brought together, a first line of sero-serous sutures, about 6 centimetres (two and a half inches) long, was applied, an incision, 4 centimetres long, was then made into each intestine, and the mucous edges were carefully sutured together, the posterior lips being united first and then the anterior; the anastomosis was then completed by an anterior sero-serous line of sutures, after which the two ends were carefully strengthened. After thorough irrigation of the parts by boiled water the parts were replaced in the abdomen, the omentum drawn down over them, and the wound closed. The operation lasted one hour and a half. The after-course was without untoward complication: on the sixth day the bowels were allowed to move. The general condition rapidly improved. At the end of seven months, when the report was made, there had been no further obstructive symptoms, but the cachexia had decidedly increased.

The author remarks that enterectomy for cancer is difficult, itself determines quite a great mortality, and does not give a certainty of radical cure. It is indicated in cases of tumors which are small, susceptible of isolation, and unaccompanied by distant glandular infection.—*Revue de Chirurgie*, November, 1893, p. 928.

VIII. Resection of Cæcum for Sarcoma; Recovery. By Dr. TH. AUGER (Paris). September 10, 1893, the author operated upon a woman, forty-six years of age, for the removal of a movable tumor in the right iliac fossa, which he had diagnosticated as a malignant growth in the cæcum. After the skin was incised it was found that the deeper layers of the abdominal wall were involved. The

involved region was freely excised, opening thus widely the peritoneal cavity. The small intestine was then clamped some six centimetres above the tumor; a second clamp was placed upon the ascending colon; and a third upon the mesentery. The peritoneum having been protected by sponges, the tumor was excised together with some small glands from the meso-colon. Notwithstanding the difference in the calibre of the cut ends of the small and large intestine, they were sewed together end to end, the mucous and serous layers being united by separate rows of sutures. The sutures in the serosa were inserted at a distance of a centimetre from the cut surface. The apposition of the two portions of intestine could not be very exact, and to provide against oozing of fæcal matter between them a wisp of iodoform gauze was placed to the bottom of the wound. The operation lasted two hours and a quarter. Shock was profound, demanding several injections of saline solution to overcome it. A slow improvement was secured; on the fifth day the gauze-drain was removed, and a drainage-tube substituted. On the next day a feculent discharge began to flow, and persisted for a month; ultimately it entirely ceased, and a complete recovery of the patient was secured. The reporter remarks that in another case he would not resort to end-to-end suture, but would implant the small intestine laterally into the large intestine.—*Bull. et Mém. de la Soc. de Chirg. de Paris*, 1893, t. xix, p. 636.

IX. Recto-rectal Anastomosis by the Aid of Murphy's Button. By H. O. MARCY, M.D. (Boston). The author, in a case in which he had extirpated a high-lying carcinoma of the rectum, the lower division of the rectum having been made at a point two inches above the anus, and the upper one four inches above, brought the cut ends together, and secured them in apposition by means of the larger size of the buttons devised by Dr. Murphy, of Chicago. Owing to the thickness of the rectal wall, he also reinforced the junction with a continuous suture. The peritoneal opening, which had been free, was sutured, and the greater part of the external wound—a "Kraske"

operation having been done—was closed; an iodoform drain being inserted at the lower angle. The convalescence was rapid and uneventful; the button was removed on the twelfth day, with some difficulty, not having become entirely free from its attachment, but its removal was hastened because the pressure of the button upon the neck of the bladder caused discomfort and some difficulty in urination. The button had been anchored externally by a strong silk ligature extending through the sphincter. The only ill effect noticed from the necessarily free opening of the sacral canal has been a marked hyperæsthesia of the cutaneous surfaces for a considerable distance above and upon both sides of the wound.

It will be interesting to note the subsequent history of the patient as to cicatricial contraction of the opening sufficient to interfere with the patency of the bowel.

The success of this operation was due in large measure to a preliminary colostomy which had been done some weeks previous to the rectal extirpation.—*Boston Medical Journal,* December, 1893.

X. Hernia of the Umbilical Cord. By Dr. LINDFORS. Lindfors collected thirty-one cases, seven of which were treated on the expectant plan, with four (59 per cent.) deaths. Twenty-four cases were operated, with four (16 per cent.) deaths. The operation, therefore, offers the best prognosis. It consists in excising the sac, freshening the edges of the ring, and then suturing.—*Schmidt's Jahrbücher,* September 15, 1893.

XI. Successful Operations for Congenital Umbilical Hernia soon after Birth. Dr. P. BERGER (Paris) reports two cases. The first case was in a female infant, twenty-eight hours old. The umbilical region was occupied by a tumor the size of a small hen's egg, a portion of which was irreducible. Chloroform was given and an incision was made in the linea alba. The hernia consisted of the small intestine; the cæcum and transverse colon were adherent. These were returned within the abdomen, and the incision closed by three layers of sutures. The first series were of catgut, and united

the edges of the peritoneum and aponeurosis; the second series united the edges of the muscles; the third series were of silkworm-gut, and united the edges of the skin. No drainage was used. Union by first intention.

The second case was in a female infant, three days old. The umbilical tumor was the size of a large walnut, and irreducible. Chloroform was given. Incision as in first case. Contents small intestine, with cæcum adherent. Reduced, and incision closed as above. Union by first intention. Cure.

The author's paper is very instructive and contains a complete list of all reported cases,—seventy-seven in number.—*Revue de Chirurgie*, October, 1893.

XII. Recent Contributions to the Literature of Retroperitoneal Herniæ. Dr. MAUSKI, in an elaborate anatomical paper, calls attention to the fact that while so much is known about the external forms of hernia, still, the study of the internal forms has been much neglected.

Treitz was the first to accurately describe these cases which have since borne his name. He reported eight cases between 1847 and 1854. To conform to his definition, the sac must be formed of peritoneum and be buried in true retroperitoneal connective tissue. This hernia may occur where the peritoneum forms a groove or furrow. The most frequent and important locality is the fossa duodeno-jejunalis, which is situated in the left hypochondriac region, posterior to the point where the duodenum enters the jejunum. It is bounded above by the pancreas, on the left by the kidney, and on the right by the aorta. There have been sixty-six cases of this variety reported.

The second most frequent locality is in the region of the cæcum. Here there may be a variety of abnormal grooves; twelve cases of this variety are reported.

The third, the fossa intersigmoidea, is in the left iliac region; the hernia occurs between the layers of the meso-colon of the sigmoid flexure. This is the rarest form and only three cases are reported.

The symptoms of these internal forms of hernia are very rarely recognized, and only one case (Studenmayer's) has been diagnosed during life.—*Münchner medicinische Wochenschrift*, June 6, 1893.

Mr. CLARKE reports a case of operation for acute intestinal obstruction, in which the whole of the small intestine was found to be contained in a sac which consisted of a double layer of peritoneum, probably in the fossa duodeno-jejunalis. After death, which was due to exhaustion, about two feet of the upper portion of the ileum were found to be congested. The rest appeared normal.—*British Medical Journal*, May 20, 1893.

Dr. SONNENBURG reports the case of a male, aged twenty-six years, who was attacked with symptoms of acute obstruction of the bowels, with marked pain in the left hypochondriac region. The abdomen was distended in the upper part, but seemed flatter lower down. Tympanites; no tumor felt; vomitus stained yellow, but not stercoraceous. As there was no improvement at the end of a week, an operation was performed. In the exploration among the intestines, a portion which was pulled upon suddenly became free, it came out from under the left end of the stomach and consisted of the upper portion of the jejunum. A sunken groove around the intestine indicated that the intestine had been strangulated. It was supposed that the hernial sac had been in the fossa duodeno-jejunalis. This is the first case where the diagnosis was made, the operation performed, and the patient recovered.—*Centralblatt für Chirurgie*, July 29. 1893.

JOHN B. WALKER (New York).

XIII. Mortality after Operations for Relief of Strangulated Hernia in London Hospitals. By JOHN CROFT, F.R.C.S. (London). Of 940 cases of strangulated hernia treated consecutively, up to 1884, at St. Thomas's, Guy's, and St. Bartholomew's Hospitals, London, the mortality after operation was 43 per cent. In 1891 Mr. Treves gave the mortality at the London Hospital as nearly 50 per cent. At St. Bartholomew's, during the last ten years, the mortality, according to Mr. Bowlby, has been reduced to 35.82 per cent. Mr. Croft, after quoting these statistics from others,

proceeds to give his personal experience. His cases number 94; of these 50 were operated upon in the pre-antiseptic period, with a mortality of over 50 per cent.; 44 have been operated upon with antiseptic precautions; death has followed in 13 instances, or in 29½ per cent.

Of the fatal cases operated upon by him in pre-antiseptic days, 16 died of peritonitis or exhaustion from protracted sufferings and feeble old age, and 5 from erysipelas or pyæmia.

Of the fatal cases operated upon with antiseptic precautions, 9 deaths occurred from exhaustion from protracted sufferings, 5 being nearly moribund when operated upon. None died of peritonitis.

Among the 94 cases of strangulated hernia there were 10 cases in which he thought it necessary to make an artificial anus. In each instance the bowel was gangrenous.

A very large proportion—viz., 7—of these occurred in the pre-antiseptic period. In each of these the bowel was in a state of gangrene more or less advanced.

He feels sure that in 4 of these the operation of primary resection and suture could not have been borne, owing to the already exhausted condition of the patients; one died an hour after operation, another two hours after, another twelve hours after, and another survived six days. This last was a woman of eighty years of age, who had been suffering already for nearly a fortnight.

The 3 others in this group of 7 were less unfavorable cases, and he thinks that two of them might have borne the operation for primary resection and suture, but that is as much as he could have ventured to predict.

Among the 44 cases operated on in the antiseptic period, there were only 3 instances of artificial anus. Not one of these could have borne the prolonged operation of primary resection and suture. The youngest, who had diseased kidneys, sank in eighteen hours after operation, and the other two, who were aged women, succumbed each in a few hours.—*American Journal of the Medical Sciences*, April, 1894.

GENITO-URINARY ORGANS.

I. The Genesis of Malformations of the Bladder and Urethra. By Dr. PAUL REICHEL (Würzburg). The theory of Duncan, that congenital malformations of the bladder and penis are caused by atresia of the urethra and bursting of the bladder or penis from pressure of urine, the author thinks is no longer tenable. Malformations in this region are due to failure of development of some fœtal structures, or failure of union of some parts which normally unite.

The author declares that there is a gastrula stage to the mammalian embryo. The blastopore at first is a transverse slit at the tail-fold of the embryo. Later the blastopore sends a process up towards the head, becoming a triangular opening, and finally a longitudinal slit, called the primitive cleft. The edges of the primitive cleft join together, except at two points, forming the primitive streak of the embryo. One of the points which remains open becomes the anus and genital cleft, the other persists for a time as the canalus neurentricus.

The tail of the embryo eventually forms the inferior border of the umbilicus. The primitive cleft, if it persisted, would therefore be an opening into the intestine from the umbilicus to a point beyond the anus. The bladder is formed for the most part from the ventral part of the intestine, and only to a small extent from the allantois. A patent primitive cleft at a later period of development would consequently open into the bladder and not into the intestine.

Ectopion of the bladder is simply a persistence of the primitive cleft throughout the greater part of its extent, preventing the formation of the anterior wall of the bladder, the anterior abdominal wall, and the symphysis pubis, besides interfering with the formation of the external genitals. The cleft may be partly closed, forming various modifications of the deformity.

Epispadias is due to a persistence of this cleft separating the two halves of the genital eminence and allowing the urethra to pass between them to the dorsum of the penis.

Hypospadias owes its origin to the failure of union of the edges of the genital fissure on the under side of the penis. The union normally takes place between the seventh and fourteenth week. The urethra of the glans penis is formed in the same manner as that of the shaft, and not by a diverticulum from the surface, as was formerly supposed.—*Archiv für klinische Chirurgie*, Bd. 46.

GEORGE R. WHITE (New York).

II. The Sublimate Treatment for the Various Forms of Cystitis. By Dr. E. LOUMEAU (Bordeaux). The use of sublimate in the local treatment of cystitis was recommended by M. Guyon, and the result of his investigations, clinical as well as experimental, was published in *Annales Genito-Urinaires*, 1892. The conclusion reached after fifteen months of careful observation is favorable to the introduction of this antiseptic as a therapeutic agent in the treatment of vesical inflammation.

Experiments conducted by M. Halle had previously shown that sublimate affords: (1) A powerful preservative action against the microbes of the air; (2) an antiseptic action upon the urinary microbes, less effective than upon the ordinary pyogenic micro-organisms; (3) a feeble disinfectant action upon purulent urine, with which unusually large quantities must be used.

The action of sublimate is more powerful than that of nitrate of silver, and the action of both is increased by acting upon the vesical wall at the same time that they act upon the urine. The unpleasant staining of the clothing associated with the use of silver is avoided by the use of sublimate.

That instillation is preferable to lavage has been demonstrated by the clinical investigations of M. Guyon and his pupils, MM. Perregaux and Collin. In twenty-six patients suffering from some form of cystitis, the effect of lavage has been compared with that of instillation. In ten cases treated by lavage, two were cured, two were improved, six were unsuccessful. Of the eighteen patients treated by instillation, eight were cured, six were very greatly relieved, two were moderately improved, two were relieved so far as pain was

concerned. In two of these cases the treatment by lavage was unsuccessful; instillation was followed by good results. Instillations are, therefore, unquestionably to be preferred to lavage. They should be begun with great care, and should not exceed twenty to thirty drops of a solution varying in strength from 1–5000 to 1–1000. The solution 1–5000, which is the one to be used at first, rarely causes painful reaction if it be prepared without alcohol and with boiled distilled water. As a result of this treatment, micturition soon becomes less frequent, and the quantity of urine is increased, denoting a diminution of sensitiveness to distention and an increased capacity of the bladder.

With lavage, on the other hand (1–5000 or 1–3000), the pain complained of by the patient was almost always very severe, and frequently compelled cessation of this mode of treatment.

M. Loumeau has followed the line of treatment laid down by Guyon, and reports nine personal observations, in which sublimate was used as a therapeutic measure. A summary of his results is as follows:

In the first three cases thirty grammes of a warm sublimate solution, 1–2000, was injected into the bladder, and allowed to remain two or three minutes. The first case was one of chronic cystitis, caused by a vesical calculus. Here the treatment was unsuccessful. The second was of gonorrhœal origin, which was complicated by tuberculosis of the bladder. The condition of this patient was improved, but the resistance of the tubercle bacillus is far greater than that of the gonococcus of Neisser, and but little change occurred so far as the tubercular factor of the trouble was concerned. The third case suffered from an uncomplicated gonorrhœal cystitis. This time complete cure resulted from the instillation. Extreme pain was experienced in each case, because instead of drops grammes were used, and the reaction was too great.

Six months later Loumeau reports the remaining six cases. In all of these a non-alcoholic solution of sublimate in boiled distilled water of from 1–4000 to 1–3000 was used. The point of application

must be carefully estimated, for what is barely borne by the mucous membrane of the bladder is insupportable in the urethra. Two of the six cases suffered from acute cystitis; four from chronic cystitis; all were of gonorrhœal origin. In the acute cases sublimate was used in the bladder alone, the reaction from sublimate in the urethra in such cases having been shown by Collin to be too severe. In the chronic cases, however, the bladder and the urethra were both treated by the remedial agent.

The number of drops instilled varied somewhat with the case. In acute cystitis twenty drops were used at each treatment; in chronic cases thirty to forty drops, according to the tolerance of the patient and the length of time that the disease had existed.—*Chirurgie des Voies Urinaires.*

H. P. DE FOREST (Brooklyn).

III. The Abbe String Saw in Urethral Surgery. By G. FRANK LYDSTON, M.D. (Chicago). The author reports a recent case which demonstrates a novel field in which the ingenious invention of Dr. Abbe, of New York, may be used. The case was that of a young man who presented a traumatic stricture in the bulbo-membranous region, and hard and tortuous multiple gonorrhœal strictures in the penile urethra. Midway between the peno-scrotal and perineal scrotal angles there was a very tight contraction, through which could barely be passed a No. 1 filiform. After three weeks' fruitless attempts at preliminary dilatation, perineal section was performed. Even under anæsthesia it was impossible to introduce a bougie larger than No. 1. After opening the urethra and dividing the deep traumatic stricture, it was found impossible to introduce a urethrotome through the penile portion of the canal, even with a guide. The stricture was so hard, tortuous, and cartilaginous that the attempt was given up after repeated trials. He then tied a fine silk thread to the filiform bougie in the perineum, and drew the instrument out at the meatus, leaving the string in the canal. After a few seconds' sawing of the string, the pressure of the string being directed towards the roof of the canal,

he drew through by aid of the first string a large silk ligature, and by the same sawing motion so enlarged the strictures that in a very few seconds he was enabled to pass a bougie of good size. The operation was then completed by means of the dilating urethrotome.

The author considers this method much more convenient and far safer than attempts to force the blades of the urethrotome through a narrow and tortuous canal, whether with or without a guide.—*Author's Abstract.*

IV. New Treatment of Hydrocele. By J. NEUMANN (Muehlheim, Germany). The writer describes a new method of treating hydrocele which he has employed successfully in six cases. After careful disinfection a trocar is introduced into the tumor. After withdrawal of the stilette, while the fluid is escaping, the canula is pushed up still farther, covered with a slightly compressing dressing of cotton and a bandage. This is left in place for two to three days. In all of his cases adhesion took place without either inflammation or suppuration. After removal of the canula, treatment is limited to local application of lead-water to the still reddened and swollen scrotal skin. The advantages of this method are its simplicity, and short period of healing as contrasted with the treatment by injection, its slight painfulness and greater assurance against consequent inflammation. Adhesion of the walls of the sac is probably due to the local influence of the canula, the alteration in pressure, and the efflux of fluid, which facilitates emigration of leucocytes which, decomposing, produce a fibrinogenous ferment which causes coagulation of the serum. With the slight compression of the bandage the surplus serum flows out, and adhesion of the two serous surfaces is permitted with rigid antisepsis without inflammation.—*Wiener Medizinische Presse*, No. 45, 1893.

V. A New Method of Treating Hydrocele. By S. SATO (Tokio, Japan). The author, in a report of the work of the Juntendo Hospital, of Tokio, describes a method of treating hydro-

cele which he has devised. It consists in scarification of the tunica vaginalis. The important points in the operation are strict antisepsis and careful checking of all hæmorrhage before suturing. In a case with a favorable course there is no trace of inflammation, swelling, or pain after operation. Generally, in about a week, the margin of the incision heals by first intention, when all sutures may be removed. But, if antiseptic precautions are not rigidly carried out, or the hæmorrhage is not checked, there will be swelling, pain, and rise of temperature. In such case remove a few sutures, and introduce a probe, to give vent to the accumulated pus and blood. Apply antiseptic gauze, and advise rest in bed. Thus treated the case will soon recover, while the inflammatory symptoms will abate. The suture materials are also important points in the method. He used silk or catgut for the tunica vaginalis, and silk for the skin. If the cutaneous wound be stitched too far from the margin of the wound the elasticity of the scrotal skin will cause it to roll in, bring the two surfaces into contact, and possibly induce separation. During the last year he has operated on twelve cases thus.—*The Sei I-Kwai Medical Journal*, No. 9, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

BONES—JOINTS—ORTHOPÆDIC.

I. Two Cases of Periostitis Albuminosa. By Dr. W. SCHRANK (Wiesbaden). The author reports two cases of this disease, both affecting the tibiæ of boys. The clinical history in each case was that of subacute osteomyelitis, but without fever. Incision of the tumors showed the presence of a quantity of reddish-yellow serous fluid, containing flocculi of fibrin and a few pus-corpuscles. The periosteum was partly destroyed and the bone affected with caries of a mild type. In one case the process had evidently been engrafted upon an old osteomyelitis, as a small sequestrum was found in the vicinity surrounded by a little thick pus.

Bacteriological examination showed the presence of staphylococcus albus in both specimens. Streptococci were also present in

the exudate from the case complicated with osteomyelitis. Inoculation of animals showed the virulence of the organisms to be much attenuated.

Periostitis albuminosa usually affects young men, frequently without any known cause. The process begins by preference near the epiphysis of one of the long bones. Swelling and localized pain are constant symptoms. The temperature is never very high, and is frequently wanting. The contents of the tumors are a serous fluid, often containing fat and mucus. The walls of the cavity are composed of granulation-tissue undergoing fatty degeneration. Fat found in the exudate comes from the walls of the cavity, and not from the marrow of the bone, as was formerly supposed.

The periosteum is partly destroyed in most cases, and the bone is slightly carious. In a few instances the periosteum has been found intact and forming the bottom of the cavity.

The staphylococcus albus has been found in nearly all cases in which bacteriological examinations were made.

There are two theories about the formation of the serous exudate in these cases. Vollert claims that it is pus which has undergone mucoid metamorphosis. The author agrees with Schlange in considering the process a modification of an ordinary suppurative inflammation due to attenuation of the bacteria or resistance of the tissue. This view is supported by the fact that the white staphylococcus, which is thought to be only a weak variety of the yellow, is usually the only germ present. In the case complicated with an old osteomyelitis the disease is supposed to be due to attenuated germs from the old inflammation. Transition forms are sometimes seen in which the exudate has a composition between ordinary pus and a serous exudate.

The author believes periostitis albuminosa is not a good name, as the process is only a modification of an ordinary inflammation, and suggests that the lesion be called "osteomyelitis serosa" or "sero-mucosa."—*Archiv für klinische Chirurgie*, Bd. XLVI, No. 31.

II. Diseases of the Bones in Typhoid Fever. By Dr. PAUL KLEMM (Berlin). According to Dopper 79 per cent. of patients dying of typhoid fever have complications of some kind. Bone lesions are among the rarer complications, although osteomyelitis is not infrequently seen. A non-purulent bone lesion occurring in typhoid has only recently been studied and described. Cases are not very numerous, but enough have been observed to give a fairly clear clinical picture of the disease.

At some time after an attack of typhoid, usually in the second or third week of convalescence, the patient complains of severe pain originating from some bone, usually in the lower extremity. Swelling gradually appears, and reaches a size about equal to the flat of the hand, and two centimetres in thickness. The skin is frequently red and warm. The tumor is usually doughy and elastic, but may become semifluctuating.

Pain and fever are constant symptoms. The pain at first is rheumatic in character, but later it becomes more localized and more severe, and is described as "tearing" or "boring." It is usually more severe at night and when the foot hangs down. The pain diminishes when the exudate is absorbed. The fever is usually of the hectic type,—higher evenings, lower mornings,—and rarely reaches 39° C. Frequently there are alternating chills and fever. If the fever continues a long time the patient becomes emaciated and the symptoms resemble tuberculosis.

The disease may terminate in one of three ways.

(1) Absorption takes place. This is the most frequent mode of termination. In most cases a periostosis remains behind for some weeks.

(2) Cheesy degeneration of the tumor takes place. The course of the disease is the same as in the previous case, but the tumor does not show any tendency towards absorption, and the temperature remains high. If the tumor is not opened and curetted it will open spontaneously and discharge necrotic tissue or pus if it becomes infected. These tumors are composed of granulation tissue, and have

much resemblance to syphilitic or tubercular lesions. The bacillus of typhoid is found in almost all of them.

(3) The process can terminate by liquefaction of the contents of the tumor. The fluid is of a reddish color, devoid of odor, almost transparent, and poor in cellular elements. The process is usually confined to the surface of the bone, but may involve deeper parts, leading to the formation of sequestra.

These tumors always contain the typhoid bacillus and no other organisms. The bacilli are undoubtedly filtered out of the blood by the bones, and are lodged in a suitable place for proliferation. The lesion produced frequently becomes infected with pyogenic organisms, and the typhoid bacilli disappear. A number of cases are on record in which both the pus-cocci and the typhoid bacilli were present in the same lesion.

Secondary infection probably comes from the environment. An instance is cited in which typhoid patients were put in a room previously used for septicæmia and erysipelas. Seven out of nine of these cases developed some suppurative lesion.

In order to determine the effects of typhoid bacilli on rabbits, the author injected a pure culture into their veins, with the following result:

(1) In all cases a primary intoxication was present, from which some died.

(2) In some the bacilli were found in the marrow of the bones, where they had increased in number.

(3) In some cases the bacilli had disappeared.

(4) Pus was found in no case.

(5) The marrow was found to be soft and of a brownish-red color.

Other rabbits were inoculated with typhoid bacilli, and after a few days given an intravenous injection of staphylococci. Four out of eleven thus treated developed osteomyelitis, although numerous experiments show that adult rabbits with uninjured bones never develop inflammation of the bones from injections of pyogenic organisms.

From the experiments the author deducts the following conclusions: Typhoid bacilli circulating in the blood are filtered out by the bones; here they may die and produce no trouble, or they may proliferate and produce one of the above-mentioned lesions, or they can form a *locus minoris resistentiæ*, which allows of secondary infection with pyogenic organisms.

The specific typhoid bone lesions are summed up as follows:

(1) Cortical osteomyelitis with tendency to absorption.

(2) Cortical osteomyelitis with tendency to cheesy degeneration.

(3) Cortical osteomyelitis terminating in liquefaction.

(4) Osteomyelitis terminating in the formation of sequestra.

These lesions should not be confounded with suppurative osteomyelitis due to a mixed infection.

The author proposes calling the above lesions "*osteomyelitis typhosa non-purulenta.*"—*Archiv für klinische Chirurgie*, Bd. XLVI, No. 41.

III. Traumatic Lateral Luxation of the Head of the Radius. By Dr. P. SCHRÖTTER (Pabianice). Dislocation of the head of the radius occurs usually before the age of twenty. Of the three forms, anterior, posterior, and external, the latter is by far the less frequent, and when it does occur, it is frequently complicated with fracture of the ulna, or fracture of the head of the radius. It can be produced either by forced pronation with adduction or forced supination with abduction. A case of the author's had this luxation produced by being lifted by the pronated forearms and shaken from side to side.

This luxation with fracture of the ulna is produced by direct violence, or the ulna is fractured by direct violence and the radius dislocated by an indirect force. Attempts at fracturing the ulna by indirect violence after the head of the radius was dislocated have always resulted in fracturing the radius.

A fracture at the head of the radius and this lesion are produced by indirect violence. The capitellum of the humerus is more apt to

split off a piece of the head of the radius when the arm is pronated and extended,—*e.g.*, falls on the pronated hand.

The prognosis of lateral luxations is not favorable. Reduction is frequently hindered by interposition of the capsule, and in old luxations it is exceedingly difficult or impossible. Retention in position is uncommonly difficult, due to the shape of the joint surfaces, and if the ulna is fractured the difficulty is even greater. If the dislocation remain unreduced the amount of motion obtainable is very limited, much more so than in either of the other dislocations; and in addition there are usually symptoms due to pressure on the muscular branch of the musculo-spiral nerve.

Reduction can be accomplished by semiflexion, adduction, and pressure on the head of the radius; or by hyperextension, supination, and adduction. A plaster bandage should be applied for two weeks, after which passive motion can be commenced. In cases complicated with a fracture of the ulna it is sometimes necessary to apply continuous weight extension.

In unreduced dislocations with a limited amount of motion, an early operation should be performed. Arthrotomy with replacement of the head of the bone should be done in suitable cases. The capsule can be sewed so as to hold the bone in position. Bardenheuer advises fastening the head of the radius to the capitellum by means of a silver wire suture which he leaves in place fourteen days.

Resection of the head of the radius gives excellent results, and is the operation that has to be done in most cases. Ten out of eleven cases, tabulated by the author, show good results in both strength and function of this joint.

The method generally employed is Heuter's longitudinal incision over the head of the radius. Réverdin adds a transverse incision across the muscles of the epicondyle, running above the nerve.—*Archiv für klinische Chirurgie*, Bd. XLVI, No. 48.

IV. Ischias Scoliotica. By W. SACHS (Mülhausen). Since its first introduction into medical literature, ischias scoliotica (Kocher)

has attracted attention from numerous authors, without any harmonious opinion on the subject being reached. They agree that a certain complex of symptoms exist in which ischias—*i.e.*, sciatica—is combined with scoliosis or kyphoscoliosis.

The author reports a case. A man, forty-nine years old, who for the past ten years has had repeated attacks of sciatica, a few months ago received a slight injury in the left gluteal region, which was followed by an attack of sciatica on that side with evident involvement of the nerves of the lumbar plexus. Several weeks after the attack the patient assumed the following position upon standing: Weight of body borne on the right leg; left leg rotated out, flexed at the hip and knee, advanced and rested on the toe. In the lumbo-dorsal region there was a marked scoliosis with its convexity towards the left. The left lumbar-muscles were prominent and hard. The under side of the right thorax was near the crest of the ileum. In the dorsal region there was a slight compensatory right scoliosis. Movements of the back, either towards the normal position or designed to increase the abnormal position, were followed by pain.

The existence of this condition—*i.e.*, scoliosis on the affected side—is due to the extension of the neuralgia from the sacral nerves to those which supply the lumbar muscles. The muscles become painful when motion is attempted. The result is that they are held quiet in a moderate degree of contraction. The muscles of the opposite side not being sufficiently opposed, draw the body over. The scoliosis at first is incomplete, as the muscles of the back are accustomed to act in unison, and any attempt at relaxing the muscles of one side and keeping those of the other side in action is at first only partly successful and accompanied with pain, but after a varying length of time attempts in this direction succeed without a consciousness of effort on the part of the patient.

The contraction of the lumbar muscles, especially the sacro-lumbalis and the quadratus lumborum, will account for the scoliosis, but the kyphosis is probably brought about by the weight of the body. Lying on the back in bed is a predisposing cause. When scoliosis is

once produced, the weight of the body tends to increase it. Simple scoliosis beyond a certain degree is prevented by the articular processes of the vertebræ. A slight increase can be brought about by rotation of the vertebræ and the production of kyphosis.

The position of the leg is determined by the painful condition of the psoas magnus. The thigh is held semiflexed and rotated outward, a position which best relaxes that muscle.

The cause of this peculiar neuralgia is usually a traumatism.

The treatment is the usual sciatic treatment: Salicylic acid, electricity, baths, and massage; followed by treatment of the scoliosis by suspension and exercises calculated to straighten the vertebral column. —*Archiv für klinische Chirurgie*, Bd. XLVI, No. 36.

GEORGE R. WHITE (New York).

V. The Treatment of Anchylosis of the Elbow. By Dr. G. NOVÉ-JOSSERAND (Lyons). Cases of true bony fusion of the bones at the elbow very frequently fail to be relieved by partial resections, and can only be cured by total and extensive removals of bone. When the joint is fixed by a simple osteophytic band at some point on the periphery of the articulation the breaking or removal of this new-formed substance may suffice to restore the usefulness and range of the joint. When, however, there are numerous extraperiosteal ossific deposits, extending into the intramuscular spaces and along the tendinous insertions, the careful ablation of all these osteophytes is called for. On account of the marked tendency of the tissues in the neighborhood of the bones to make bone, it is necessary in these cases to take away a certain amount of the substance of the bony column itself, and to observe the technique of interrupted subperiosteal resection. If the extremities of the bones are joined together, either by dense fibrous tissue or by bone, it is necessary in order to have a movable articulation to produce a decided interval between the cut surfaces, and resection alone can accomplish this. The dictum of Ollier is quoted that it is not possible to obtain a movable articulation by a simple bone section when the divided

surfaces remain in apposition, especially after a curved or semicircular section. Total resections, quite extensive, of the elbow give in young subjects elbows of nearly normal shape. The power also of the limb is not much more hazarded by a well-devised total resection than by a semiarticular resection. In young subjects reparative activity is so great that secondary anchylosis can be prevented only by removing a considerable amount of bone, perhaps four centimetres in length, in cases of rectilinear anchylosis; in cases a little flexed a piece three centimetres in front and from four to five centimetres behind should be removed. In adults, however, a much more restricted removal of bone is to be made. By taking away more or less bone we may in some sort manage so as to have as a result much mobility with less strength, or great solidity with restricted mobility. In old cases, in which the muscles about the joint have become degenerated and atrophied, less extensive resections must be made if a firm limb is desired.

The author describes the operative method of Ollier in resections of the elbow. As a first step care is taken to re-establish the articular dividing line by the bistoury and cutting-forceps in cases of fibrous adhesions; by the chisel and mallet when the bones are completely fused. It is very important to preserve the lateral ligaments and the attachments of the periosteo-capsular sheaths of tendons. Especially is it desirable for the prevention of recurrence of the anchylosis to excise a girdle, from one to two centimetres in width, of periosteum entirely around the articulation. This procedure constitutes the "interrupted subperiosteal resection" of Ollier.

The after-treatment is of great importance. Early mobilization is necessary. It should be begun between the eighth and tenth days. At first the attempts at mobilization should be short and at long intervals, taking care not to excite pain. If movements are persisted in which cause pain, inflammatory reaction will be excited in the new joint, which will determine anchylosis. In the intervals between the attempts at mobilization the limb should rest upon a splint. A little later the splint may be kept applied only at night, while during

the day the patient is encouraged to move his joint himself, at first passively with his sound hand, then actively. Gradually the extent of the movements is increased. If, as the result of too violent or prolonged exercise, a subacute arthritis should be excited, all mobilization should be suspended, and abundant douching with complete rest enjoined until the tenderness has completely subsided. Finally, at the end of one or two months, when the limb is already solid and the joint quite painless, the splint is permanently suppressed, and the result is perfected by massage and faradization of the muscles, and by causing the patient to carry light weights so as to increase muscular power. Later, if any tendency on the part of the joint to stiffen shows itself, elastic traction should be made use of until motion to a full physiological range is obtained.

In the more complicated cases, with diffuse ossification and much atrophied muscles, to these systematic mobilizations should be added continuous extension, chiefly at night, by which the articular surfaces are kept separated from each other and the formation of an articular space is favored. This may usually be accomplished by very simple apparatus,—the forearm being held in semiflexion by a rubber band, which tends to flex it, there may be fixed to its upper part near the elbow a little leather collar from which a weight of from 300 to 800 grammes is suspended. The patient can thus move the joint without interfering with the traction. He can also get up and walk about without inconvenience. Should this apparatus not be sufficient, extension can be applied to the extended forearm by a sticking-plaster traction apparatus while the patient is in bed. The two methods can be combined, the one being in use during the day, the other at night.

The exact application of the rules thus outlined will enable a surgeon to undertake with success the relief of cases of anchylosis which have recurred again and again after operations for their cure which have been less radical or less carefully managed in their after-treatment. Such secondary operations should be deferred for four or five months at least,—that is to say, until the tissues about the

affected part have become restored to a healthy state. These repeated resections, when they are properly done, do not bring any risk to the ultimate strength of the limb.—*Revue de Chirurgie*, December, 1893.

VI. Acupuncture in Delayed Union of Fractures. By Professor NICOLAYSEN (Christiania). The writer read a paper at the first Congress of Scandinavian Surgeons, held at Gothenburg, July 6–8, on the ætiology and treatment of delayed union after fracture. He claims that he has obtained the best results with acupuncture. If union be long in forming, he introduces sewing-needles, 4 to 5 centimetres in length, between the ends of the bones, and lets them remain there from a half to one hour. They are then removed, and an antiseptic bandage and splints applied. It may be repeated if there be no distinct callus formation after two to three weeks. Professor Studsgaard, of Copenhagen, states that treatment must necessarily vary in different cases. In case there was atrophy of the ends of the bones, acupuncture would not be indicated. He has been obliged to do amputation of the femur in two cases. Still he performs resection or employs ivory pegs or steel nails. Professor Berg, of Stockholm, has used injections of the chloride of zinc with success. Professor Plum, of Copenhagen, in true pseudoarthroses, always resects. In protracted healing, he advises patience, the circular bandage above the place of fracture, and massage. In children with fracture of the bones of the leg the prognosis is unfavorable. Tscherning advises the early use of the extremity.—*Norsk Magazin for Lagevidenskaben*, No. 9, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

GYNÆCOLOGICAL.

I. A New Method of Aiding in the Atrophy of Uterine Myoma without Removal. By F. B. ROBINSON (Chicago). This new method of operating for uterine myoma consists: (1) In ligating the ovarian artery with or without tubal and ovarian removal; (2) in ligating the uterine artery which courses along the sides of the

body of the uterus for a half or two-thirds its length from the fundus to the cervix. The object is to induce uterine atrophy and avoid the danger of removal of uterine myoma. The mortality over tubal removal will scarcely be increased by the additional time and manipulation necessary to ligate the uterine artery coursing along the body of the uterus. A well-curved aneurism-needle may be used in performing the operation, thus avoiding the sharp-pointed needle, which might lacerate the vein or artery. One can put the finger and thumb on the artery and feel it beat close to the uterus.

II. Suture of Divided Ureter Terminating in Recovery. By Dr. E. W. CUSHING (Boston). The author reports that in the course of an operation for removal of a large myofibroma of the uterus, the left ureter, having been mistaken for a blood-vessel, was cut and ligated. After the tumor had been removed, the cut vessel was identified as the ureter. The ligature was then removed, the corresponding end searched for and found, and the two ends were sewed together, two silk and one catgut sutures being used for the purpose. The ureter was replaced in its proper site on the pelvic floor, and an iodoform-gauze drain packed about the site of the suture and brought out through the abdominal wound by the side of a glass drainage-tube, which was also inserted to the bottom of Douglas's pouch. The stump of the uterus was fastened in the lower angle of the abdominal wound, and the tube and gauze were brought out above, being separated from the stump by two sutures.

The patient did well after operation, but on the fourth day the discharge from the gauze was ammoniacal. The amount passed from the bladder was normal. A rubber tube was then substituted for the gauze. The uterine stump was cut away on the tenth day. The quantity of urine escaping from the tube was never more than three ounces in twenty-four hours. The tube was removed on the fourteenth day. A slight amount of urine continued to escape from the fistula for some months, but at the end of nine months it had entirely ceased, and the patient was in perfect health. One silk ligature came

away from the fistula before it closed.—*Annals of Gynæcology and Pædiatry*, December, 1893.

III. Vaginal Hysterectomy with Morcellement or Division of the Uterus. By Dr. P. MAUCLAIRE (Paris). I. *For Myofibromata.*—When the uterus is voluminous, without adhesions or with but few, more particularly in those cases of fibroma in which the growths are pelvic, within the broad ligament, crowding the uterus to one side and protruding well into the vagina, or when the fibromata are intrauterine, vaginal hysterectomy by a process of biting away (*morcellement*) may be resorted to.

All the varieties of traction and compression forceps may be useful in the course of the procedure.

The uterus having first been drawn down as much as possible, the vaginal mucous membrane is to be incised at its insertion into the cervix. The cervix should then be freed by dissection with the finger-nail, and with the end of the retractor used as a blunt dissector. The dissection should keep close to the uterine tissue, which serves as a director. The cervix having been freed throughout its whole height, the pulsation of the uterine artery in the broad ligament on either side will be felt for by the finger. Having been recognized, a compression forceps is put upon that portion of the broad ligament which includes it. The greater part of the ligament held by the forceps is then cut, but not all, lest bleeding should follow. The cervix is then incised on either side, making an anterior and a posterior flap out of it. The anterior flap is preserved for purposes of traction. The posterior one is cut away with scissors. While further traction is made upon the uterus, the bladder is detached from its anterior face by the conjoint use of the finger and the retractor. When the peritoneal reflection is reached, it is opened, and with the finger the opening is enlarged, while the two ureters are pushed forward and to the side. Behind the recto-uterine *cul-de-sac* is then opened, and a posterior retractor placed so as to protect the rectum, while an anterior retractor protects the bladder.

Returning to the broad ligaments, as the surgeon advances in the removal of the uterus, they are clamped on either side with forceps, the finger first having determined what tissue is embraced by the forceps.

The surgeon then with scissors or knife can take away in fragments of varying form portions of the uterus or of the tumor. It is important always before cutting loose a fragment to take a new hold of the tissue beyond the line of section. To effect this the piece to be taken away should only be detached in part at first, then by traction on this the rest of the uterine mass is drawn down so as to be seized with a new forceps. Without this precaution a risk would be run that the rest of the uterus should slip away and disappear in the cavity of the pelvis. The above is the method of Péan.

The whole uterus having been taken away, the appendages may be drawn down into the wound either with the fingers or with a forceps if they are not too adherent. A forceps having been placed upon their pedicle they can be removed.

If the uterus cannot be brought down easily, it is necessary to be careful about transverse cuts, for the stump would afford a poor hold. It is better to seize either side with forceps, and to attack the organ along the middle line, to dig out the uterus by vertical or oblique cuts, and to continue this central coring process progressively from below upward. The uterus then, under the influence of traction, comes down like a cone towards the vulva, making for itself its hæmostasis by the compression. When the uterine cornua come into view, the end of the work is appreciated. Not a fragment of tissue should be seized, not a cut with scissors, or bistoury made without the operator seeing exactly what tissue was involved in his attack.

Whenever the tubo-ovarian mass is placed high, and is very adherent, the finger reaches it with difficulty. It is necessary then to make traction upon the corresponding uterine horn, as the parts come down a little, they can be detached. If, however, they are found to be enclosed in a tough fibrous mass, which remains fused together behind the broad ligament, it is better to leave them. They will atrophy in due time.

Müller modifies the above procedure by dividing at the outset the uterus vertically into two symmetrical halves, after having turned it over, or simply drawn it down. Then each half of the uterus can be drawn down, and its ligament tied very easily.

Quénu, after the cervix has been well denuded, and not before, cuts the cervix from before backward, so as to divide it in two lateral halves. The traction forceps are then pushed up a little higher, and always upon the side. As a new portion of the uterus presents itself, it is denuded, and the antero-posterior section is continued. Thus the fundus of the uterus is quickly reached, the fingers, introduced into the peritoneal cavity, are hooked over it, and its median division completed. As the uterine mucosa appears, it is touched with a solution of chloride of zinc,—1 to 10.

Each half of the uterus is then seized near its fundus, drawn out, and, after a long forceps has been clamped upon its broad ligament, it is cut away.

Doyen, after having first dilated the vagina for forty-eight hours by a ball pessary, proceeds with the following steps:

(1) Pulling down of the cervix; circular section of the vagina; opening of the *cul-de-sac* of Douglas; separation of any adhesions to the posterior surface of the uterus, if any exist.

(2) Pushing back of the bladder and ureters with right index finger. Longitudinal division of the anterior wall of the cervix, and opening by one or two strokes of the scissors of the anterior peritoneal *cul-de-sac*.

(3) Progressive pulling down of the anterior portion of the uterus by successive holds, made with four forceps, which seize it higher and higher up. Care is taken with each successive hold to extend the section of the anterior wall of the organ, in order to facilitate its outward progress. If the uterus is too voluminous, a wedge-shaped section may be made in the anterior wall, and the wedge removed by the biting-away process.

(4) The fundus of the uterus is pulled over forward and drawn out, and afterwards the appendages, whose adhesions are detached

with the finger as occasion may require. If there are ovarian or tubal cysts complicating the fibroma, they are incised to diminish their volume.

(5) A clamp is then applied almost vertically from above downward to one of the broad ligaments, usually the left, beyond the appendages. A second more delicate clamp is placed within the large one for greater security, and the ligament is cut away to its inside, the other ligament having been treated in the same way the uterus is removed.

If the vulva is not too narrow, and if the uterus has not more than doubled in volume, it is sufficient to make a simple longitudinal anterior division of the organ,

II. *For Pelvic Suppurations.*—The patient should by preference be placed in the dorsal decubitus, to facilitate the natural outflow of the pus. The vaginal mucous membrane is first separated by incision from its attachment into the cervix, and the cervix freed as high as possible with the finger, hugging the uterus as a guide. Nothing should be torn without being certain as to what it is. If, as the work progresses, collections of pus are opened into, they should be thoroughly cleansed and disinfected.

For controlling bleeding, a clamp should be put on the base of either broad ligament, not extending beyond the limits of the denudation of the cervix. This will compress the uterine artery.

The cervix is then cut away, and traction forceps are placed upon the body of the uterus. Proceeding, it is necessary to keep to the middle line, while the uterine tissue is taken away piece by piece. As pus collections are met with free drainage for them is to be provided. Bleeding-points are clamped. More or less quickly the cornua are reached and are secured by suitable forceps. After the pus cavities have been emptied and washed out, an attempt may be made to detach the appendages, bring them out and remove them, but it is not often practicable. If, as sometimes happens, a cavity is found to communicate with the intestine or the bladder, there will remain fistulæ, which often spontaneously close.

The after-treatment comprises irrigation of the cavities; some, which were not opened during the operation, will often open of themselves later. Gradually the cavities contract, the necrotic tissue is cast off, and a process of granulation completes their healing.

There are cases in which total extirpation of the uterus is impossible. The fundus escapes from view, and it is wise to abandon it. Little inconvenience results if all the pus cavities have been opened. But the infected uterine stump may not atrophy, and may become the source of true menstruation and of inflammatory crises in the adjacent tissues.

Vaginal hysterectomy for pelvic suppurations may be complicated by friability of the uterus, hernia of the small intestine and of the omentum, hæmorrhage, clamping, or wounding of the ureter, the rectum, the bladder, the small intestine. Secondary hæmorrhage, ureteral, vesical, or intestinal fistula, peritonitis, persistent vaginal purulent fistula, may complicate its later history, but these complications are relatively rare.

The great advantage of vaginal hysterectomy in cases of pelvic suppuration is the good drainage which it offers to all or nearly all pus accumulations, and also that, owing to the roof of suprapelvic adhesions, the operation is practically outside of the peritoneal cavity. If the cavity is high up, and if the lesions are unilateral, abdominal section should be made; if the cavities are down in the pelvis, in contact with a vaginal *cul-de-sac* and bilateral, the vaginal path should be chosen.—*Annales de Gynécologie et d' Obstétrique*, October, 1893.

REVIEWS OF BOOKS.

FIRST AID IN ILLNESS AND INJURY. By JAMES E. PILCHER, M.D., PH.D., Captain in the Medical Department of the United States Army. Revised edition, with 176 illustrations; 322 pages. New York: Charles Scribner's Sons, 1894.

Among the many "first aid" books which have appeared within recent years, this book by Dr. Pilcher may well take first rank, not only by reason of the scientific information which it contains, but because of the accurate, concise, and simple way in which the author writes. Many books, similar in character, contain so many Latin phrases and technical expressions that the layman who attempts to read them, becomes discouraged at the outset of his studies; this little volume, on the contrary, is singularly free from such bugbears, and may be read with pleasure and profit by any one.

The book is "comprised in a series of chapters on the human machine, its structure, its implements of repair, and the accidents and emergencies to which it is liable." The groups into which these chapters naturally arrange themselves form the four parts of the book.

Part I treats of "The Construction of the Human Machine." The covering,—the skin, the padding,—the fat, the framework,—the bones, the hinges,—the joints, and the various other systems of anatomical apparatus is each made the subject of a chapter. The essential facts of this abbreviated anatomy are described clearly and concisely; important details are also given, but printed in smaller type; this plan of differentiation is used throughout the book.

"Germs, their Action and its Control," is the title of the opening chapter of Part II, which is devoted to the implements of repair. Asepsis and antisepsis are clearly explained, and their value is em-

phasized. Since "first aid" dressing-packets are now to be had, ready for use, the importance of being able to use them intelligently, and in such a way as to utilize their benefits is manifest. Knots, bandages, dressings, and applications are described in the succeeding chapters of this part of the work. The paragraphs devoted to the triangular bandage and its use are profusely illustrated, and compare very favorably with von Esmarch's own book on the subject. The roller bandage is also described, but "as the triangular bandage is better adapted to the non-professional hand, greater prominence has been given to it in this work."

In the third portion of the book is discussed the subjects of emergencies and accidents, and their treatment. This is, of course, the kernel of the nut, and here the original work of the author appears to the best advantage. The opening chapter gives many valuable suggestions on how to act at first. Following this, all of the usual forms of injuries are discussed, and the chapters devoted to the treatment of bleeding and of fractures are especially commendable. The chapter upon the emergencies of the battle-field, and the various forms of medical relief provided during actual hostilities, is of value to military readers. They will be interested, too, in the Hospital Corps Drill Regulations, which are reprinted entire as authorized by the Secretary of War.

Part IV, the "Care of the Human Machine," is a short chapter containing some good sanitary suggestions for the regulation of ventilation, disinfection, deodorization, cleanliness, clothing, and food.

The illustrations of the book are numerous and well executed. There are a number of full-page plates, showing the nerves, muscles, arteries, and veins of the body, the last two mentioned being colored. The numerous photographic reproductions of soldiers, illustrating the use of apparatus or treatment, give to the book quite a military air.

The aims of this contribution to the literature of the subject are: (1) To strip the subject as far as possible of technicality; (2) to avoid dwelling upon procedures requiring medical experience for their application; (3) to make a distinction between essential points and

details, which, while valuable, might be omitted without damage. That Dr. Pilcher has succeeded in his endeavor his readers will bear witness.

The fact that one edition of the book has become exhausted shows that it is appreciated by those who have occasion to use such a work. Teachers in both civil and military circles who wish for a small but comprehensive book of reference as a basis for their instruction, and for recitation purposes, will find Dr. Pilcher's book well adapted to their needs. It has already been recommended as the standard text-book in many "red cross" societies, and by regimental surgeons who are engaged in organizing and instructing ambulance corps in their respective commands. The book is so small that it can easily be carried in the pocket or knapsack.

H. P. DE FOREST.

LA MOELLE ÉPINIÈRE ET L'ENCÉPHALE, avec applications physiologiques et médico-chirurgicales, et suivis d'un Aperçu sur la Physiologie de l'Esprit, par CH. DEBIERRE, professeur d'anatomie à la Faculté de Médecine de Lille. Royal 8vo, 450 pages; with 242 illustrations in black and in colors, and one chromolithogravure. Paris: Félix Alcan, Editor.

Debierre, who is professor of anatomy at the medical school at Lille, has already written a general descriptive anatomy, and the present volume takes up in detail the structure of the spinal cord and of the brain. The lectures of the author at the medical school have served as the basis upon which the present work has been developed, and the book is now presented to the medical world as, in a measure, a digest of these studies, modified and adapted to their new purpose.

The author has not confined himself to macroscopic anatomy alone; the histology, physiology, embryology, and morphology of the structures are also given, with their relationship to one another. These and similar studies upon corresponding fœtal parts are com-

bined to throw light upon this comparatively obscure corner of human anatomy. Our knowledge of the evolution and functions of the great nerve-centres has been revolutionized within the past few years, and in their description from the stand-point of to-day, M. Debierre has considered the co-ordinate discussion of pathology and physiology as important for the student as for the practitioner; in this domain, especially, it is impossible to make an accurate diagnosis without a thorough knowledge of the anatomy and physiology of the structures involved.

When we examine the book in detail we are at once impressed by the very meagre table of contents, and by the entire absence of an index,—deficiencies which detract greatly from its value as a book of reference.

The chapters devoted to the general structure of the nerve-centres and to the meninges are short, but contain the essentials of the subject.

The main portion of the work is devoted to detailed descriptions of the various parts of the brain and of the cord; the articles upon the structure of the cord, the cerebral convolutions, the internal capsule, and cerebral localization, are especially noteworthy.

In the closing chapter M. Debierre has given a valuable account of psycho-physiology. The philosopher, as well as the physician, may study this chapter with advantage, for both should be familiar with the history of the mental faculties, and should know how they originate and develop, and how they are acquired, disturbed, or lost.

The illustrations used are numerous, and are well executed. Four colors are used in many of the plates; others are photogravures of specially-prepared specimens in the author's possession. In the articles upon the brain many of the illustrations are drawn from the domain of comparative anatomy, and are of unusual interest. Many diagrams are given to illustrate the relative position of fibres at various levels, and beside these there is a large chromolithogravure showing the course of nerve-fibres in the central nerve tracts.

The work contains the results of many personal researches of the author, and the most recent-published results of investigations upon the same subjects. For the specialist, or for the student desirous of becoming conversant with the minutiæ of the subject, the book will be found to be a worthy companion for the similar works of Obersteiner and of Edinger.

H. P. DE FOREST.

LES CENTRES CÉRÉBRAUX DE LA VISION ET L'APPAREIL NERVEUX VISUEL INTRA-CÉRÉBRAL. Par le Dr. VIALET, Ancien Interne des Hôpitaux de Paris. Avec une préface de M. le Dr. DÉJERINE. Paris: Félix Alcan, 1893. Price, 15 francs.

This is a very elaborate work of 355 pages, illustrated by sixteen phototype plates, besides numerous cuts in the text,—ninety figures in all. It is directed especially to neurologists and ophthalmologists, but also to every student of the finer cerebral anatomy and pathology.

The first part (forty-eight pages) gives a relatively brief review of the anterior or extra-cerebral anatomy. The second part gives the corresponding intra-cerebral anatomy, an abstract of eighty-eight pathological cases collected from the literature of the subject, a close study both clinically and pathologically of five personally observed cases, and, finally, a summary review of the established facts.

So complete a work on one of the most advanced branches of practical neurology is necessarily interesting both from its presentation of what is already known and for any new light that it may shed. His five cases include three of cuneus lesion with hemianopsia, and two of word-blindness from lesion of the angular gyrus.

In the final chapter, six distinct questions or problems are considered on the basis of all the cases given. His very modestly-stated conclusions can only be given in part,—

(1) Localization of the cortical visual centre. The hemianopsia that complicates word-blindness is only produced by a destruction of the deep intra-cerebral visual fibres. The cortical centre of vision

occupies the whole internal face (of the occipital lobe). It is limited anteriorly by the parieto-occipital fissure, above by the superior border of the hemispheres, below by the inferior border of the third occipital convolution, and posteriorly by the apex of the occipital lobe.

(2) Do there exist separate centres for space, color, and light sensations? This supposition he considers disproven.

(3) Anatomical course of the visual conductors. Situation of the optic radiations in the sagittal white substance of the occipital lobe. Their relations with the ganglionic centres of vision. These centres are represented by the pulvinar, the external geniculate body, and to a less degree the prequadrigeminal tubercle.

(4) Relations between the different segments of the retina and the cortical visual sphere. Sectoral hemianopsia.

(5) Association-fibres in relation with the cortical visual centre. Callosal or inter-hemispheric fibres. Intra-hemispheric association-fibres.

(6) Distinction of a visual centre of perception and of a visual centre of recollection. Relation of these centres between themselves. Association-fibres connecting them.

WILLIAM BROWNING.

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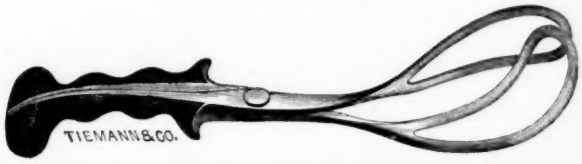

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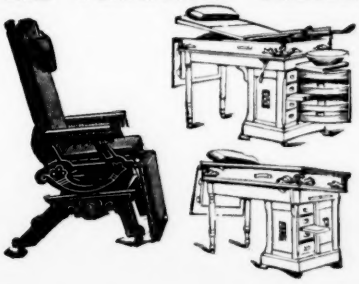

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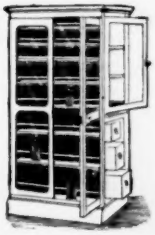

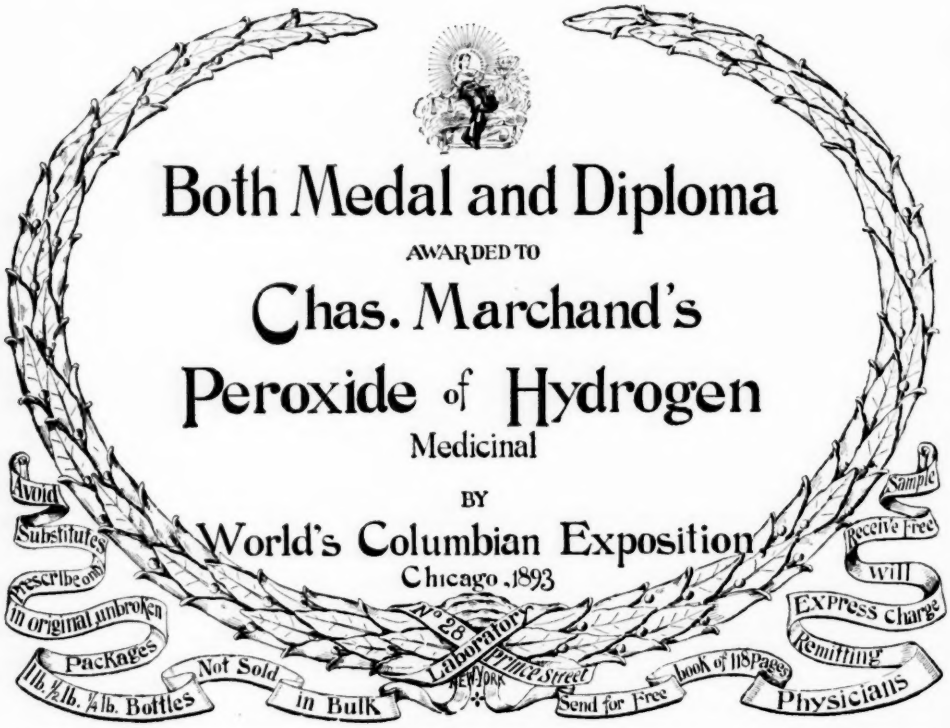

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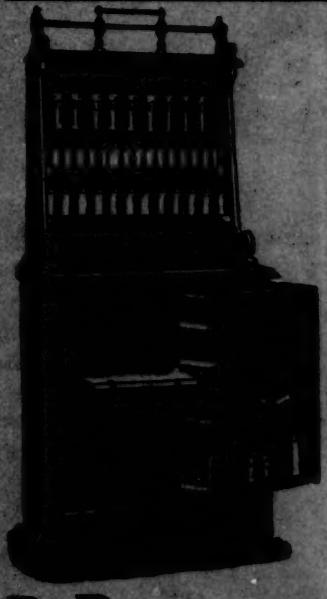

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